RECENT RESEARCHES IN SPORTS SCIENCE

HENRIETTE DANCS, MIKE HUGHES, ALFONSO PENICHET AND JOEL GAILLARD

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FOREWORD

It is 13 years since a group of us retired to a restaurant in Opatija in Croatia, to bemoan the lack of presentation skills and research methods knowledge in the current crop of postgraduate students. We had just attended a Research Methods session in the "Kinesiology" Conference hosted, by the University of Zagreb, and were all surprised by the poor levels of performance by the attending presenters. Fortunately, in the group was Dr. Dancs, the last true action person, who decided to tackle the problem.

Here we are now – back in Szombathely for the 12nd time to implement the Concept of knowledge and experience through 'doing' – to learn about the pitfalls of presenting scientific material by actually doing it at an international Conference and reciving positive feedback after the experience. All theses Conferences have been aimed at giving young researchers the positive experience of addressing an international audience and in the process perhaps gaining a publication. The way that Dr. Dancs has integrated the Conference into the start of the Christmas season has become a huge bonus and a blessing.

In the last 12 years we have staged over 1000 presentations in all disciplines of sport science, and of these, over 600 have resulted in publications in books or journals. These are looked upon as useful additions to developing CV's.

The Christmas Conference is now the main conference of INSHS, our international network. Despite the success and tradition established, we are entering new phases and are ready (eager?) to embrace new ideas and technologies. We have already established e-posters as acceptable and are exploring other formas of e-presentations through our rapidly developing website.

The authors of the reviewed and accepted papers in this book have been presented their papers on the 12th INSHS International Christmas Sport Scientific Conference, 5-6 December 2019, Szombathely, Hungary.

Prof. Mike Hughes

RECENT RESEARCH IN SPORTS SCIENCE

Vol. II

International Network on Sport and Health Science (INSHS)

„We believe in Knowledge Alliance"

ABOUT INSHS

- Established as a thematic academic network in Hungary in 2005.
- Registered as a non - profit network - organisation in France in 2017.
- Operating as a membership- based hub organisation.
- Members are: departments, institutes, shools, faculties of universites, networks, organisations.
- Its main goal is to support international (European and non- Europan) cooperation on the field of sport science (kinesiology) and health science. Therefore INSHS works as an accelerator of internationalization among its member institutions and other sport, sports science related organisations and higher education institutions.
- Its main activities include creating bridge mainly among its members, coordinating and managing and disseminating, fostering research projects, organizing events, e-events (conferences, workshops, camp etc.), sharing news, information about international projects, study and mobility programs, EU calls etc.) in sports and health science for its members.
- Its main events are the annual INSHS Convention and Conference and the Christmas Sport Scientific Conference organized in partnership with the member institutes.
- The success of INSHS is marked by many thriving organized academic events, research projects, international study programmes, student and staff activities over the past 15 years. The representative colleagues, staff from the different university faculties /schools and institutions became not just colleagues, but also trusted friends.
- The challenge of INSHS is to be known all over the international academic world in sports (kinesiology)- and health science and support the effectiveness the co-operation among the members, members-to-be and other professional networks, associations and players in the sport industry.
- INSHS will start operating virtual as well and has the aims to start multiple digital activities on different online platforms (Mircrosoft Teams, Linkedin).

See more about INSHS: https://www.inshs.info/

Previously Conventions:

Szombathely, Hungary (2005) Magdeburg, Germany (2006), in Ljubljana, Slowenia (2007), in Bad Gleichenberg, Austria (2008), in Cardiff, Wales (2009), Telemark, Norway (2010), Tartu, Estonia (2011) and Zagreb/Opatija, Croatia (2012), Volos, Greece (2013), Alicante, Spain (2014), Alexandria, Egypt (2015, cancelled)., Brno (2016), Nancy, France (2017), Calpe (2018), Las Palmas, Spain (2019).

Budapest, Hungary (2020) - 1st Video-conference, St. Petersburg (2021).

INSHS main research interest are:

- Sport and inclusion/Sport and Disability
- Sustainable Development though Sport/Social responsibility
- Performance Analysis in Sport
- Sport for Health/Active life style
- Olympism/Olympic Studies
- Physical Education current challanges
- Violance in Sport

INSHS Management:

Dr. Joel Gaillard, General Manager of INSHS: joel.gaillard@univ-lorraine.fr

Dr. Henriette Dancs, General Secretary of INSHS: dancs.henriette@ppk.elte.hu

Natalja Babic, Head of International Relations of INSHS: natalija.babic@kif.hr

Contact: inshs.nancy@gmail.com

Partner Institutions which still are or those which have ever been involved with INSHS events, programs, projects (from 2005):

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NETWORKING

INFORMING

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Running movements and coordination structure characteristics under spinal cord transcutaneous electrical stimulation.

Barkanov, M.G., Ivanov, S.M., Mikhaylova, E.A. and Ershova, N.G.

Velikie Luki State Academy of Physical Education and Sports Velikie Luki, Russia.

Abstract

At the heart of the effectiveness of competitive activity of short-distance runners are complex interactions of functionality and features of motor coordination, manifested in locomotives with maximum speed. Management of motor actions parameters and regulation of size of the developed efforts are carried out at the expense of coordinated activity of the Central nervous system and the muscular system of the athlete. In this regard, the question of purposeful changes in the functionality of the motor system of athletes remains relevant. In the work of G. Courtine with co-authors "Targeted neurotechnology restores walking in humans with spinal cord injury" (2018) the possibility of improving the efficiency of rehabilitation processes in patients with motor disorders with targeted epidural electrical stimulation of the motor neuron pool of flexor and extensor muscles of the thigh and tibia is shown. In this regard, it seemed appropriate to study the possibility of activating these motor neuron pools, which in its turn will improve the coordination structure of the running cycle through transcutaneous electrical stimulation of the spinal cord in relatively healthy athletes. The subjects run at maximum speed for 10 sec on the treadmill in a passive mode with transcutaneous electrical stimulation of the spinal cord and for another 10 sec without electrical stimulation. During the exercises the kinematic characteristics of swing-up leg movements and electrical activity of the skeletal muscle were registered. It was revealed that the distance of anthropometric points' relocation while performing the swing-up leg movements in a running cycle does not change, and the speed of relocation increases. The electric activity of muscles participating in hip flexion is higher while running with stimulation, and the activity of shin muscles is lower than when running is performed without electrical impact. Neurophysiological studies have shown that rhythmic activity in the descending pathways is formed mainly on the basis of signals from the spinal locomotor generator. On the basis of information on its activity adequate supraspinal influences on activity of spinal mechanisms are carried out. The signals of the locomotive generator provide information about the phase of the locomotive cycle.

Keywords: electromyographic features, transcutaneous electrical stimulation, spinal cord, kinematic features

1. Materials and methodology

Thirteen men aged 20 to 23 years were involved in the experiment. All subjects ran at (with) maximum speed on a treadmill (HP CosmosSaturn), which was in passive mode. Each subject ran for 10s without stimulation and 10s with continuously electrical stimulation of the spinal cord. Two-channel stimulator KULON (St. Petersburg state University of aerospace instrumentation) was used for stimulation. Stimulating electrodes were located at the level of vertebrae T11-T12 and T12-L1 between spinous processes. The strength of the electric stimulus was selected individually for each subject. The pulse repetition rate was 30 Hz. Rectangular bipolar stimuls (0.5 ms) were filled with a carrier frequency of 10 kHz to prevent pain.

The Qualisys video system was used to register the kinematic characteristics of the foot movements. Reflective markers were attached to the reference points of the body, coinciding with the axes of motion in the shoulder, hip, knee and ankle joints.

Bioelectric muscle activity was recorded by bipolar surface electrodes using a 16-channel electroneuromyograph ME-6000 (Finland).

2. Results

To analyze the dynamics of kinematic characteristics and EMG activity, the running exercise was divided into 4 parts: 1-part-3 running cycles and then 5 running cycles each.

When running on the track (being in passive mode), it was found that in running without stimulation, athletes performed an average of 18 running cycles, while with transcutaneous electrical stimulation, of 19 running cycles an average.

In standard conditions, the increasing in the number of cycles can occur by reducing the length of the step. It will affect the execution time of the entire running cycle and its individual phases. To exclude this fact, the distance traveled by anthropometric points during the execution of centrifugal actions under the influence of electrical stimulation and without it was analyzed. As a result, it was revealed that the distance traveled remained unchanged or was slightly increased. This fact suggests that the reduction in the time of the fly phase is not associated with a decrease in the distance traveled by the links of the body. Therefore, it can be assumed that the movements were performed with greater speed.

Table 1. The distance traveled by the knee anthropometric point along the horizontal and vertical axes when performing fly phase (m).

Anthropometric point	Running conditions	Horizontal axes				Vertical axes			
Fly phase	(cyclic)	1-3	4-8	9-13	14-18	1-3	4-8	9-13	14-18
Knee	Without electrical stimulation	0,5	0,6	0,59	0,58	0,3	0,3	0,34	0,34
	With electrical stimulation	0,5	0,6	0,6	0,58	0,3	0,3	0,34	0,34

As a result of the analysis of the speed of movement of the upper knee anthropometric point along the vertical and horizontal axes of motion in the fly phase, it was revealed that in the horizontal plane when performing fly, the speed was higher when running with stimulation by an average of 9.3%. The vertical component of the speed of this anthropometric point in all cycles was higher when running with an average impact of 39.3%.

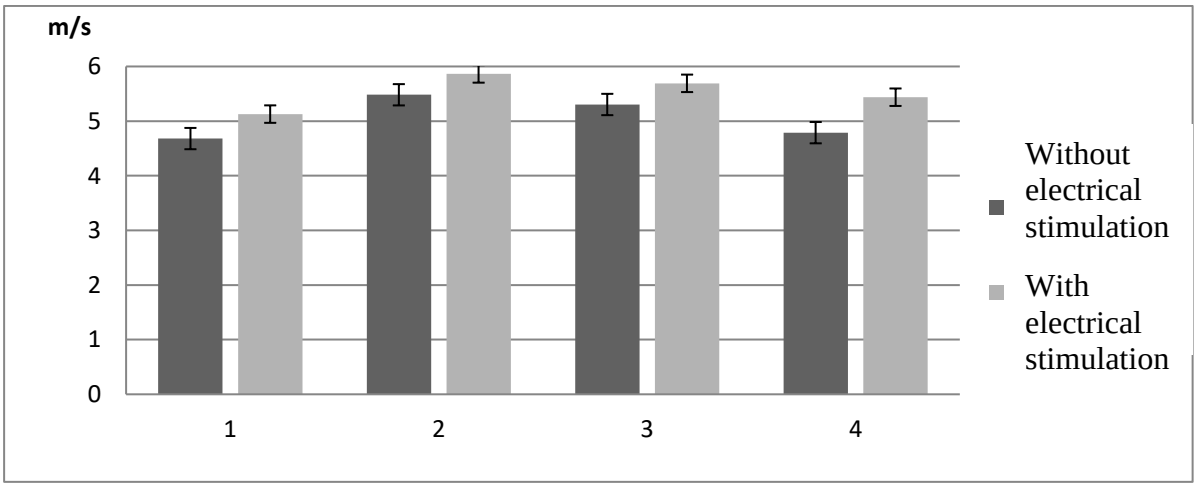

Figure. 1. Knee anthropometric point speed along the horizontal axes during fly phase, m/s.

The source of driving forces in running is the skeletal muscles work. In the conducted studies, the use of continuous electrical stimulation of the spinal cord against the background of performing arbitrary locomotor movements was accompanied by an increase in the activity of skeletal muscles producing movement in the hip joint. In the fly phase, the electrical activity

of the muscle straining the broad fascies of the thigh (m. tensor fasciae latae), which is involved in the flexion of the thigh, increased to the greatest extent. Quantitative assessment of EMG activity parameters is an indirect characteristic of the descending nerve drive to the muscles. The increase in the amplitude of EMG of the main working muscles when performing running movements can be due to increased neuronal activity of the motor neuron pool of these muscles under the influence of transcutaneous electrical stimulation of the spinal cord, as a result of which a greater number of motor units are recruited.

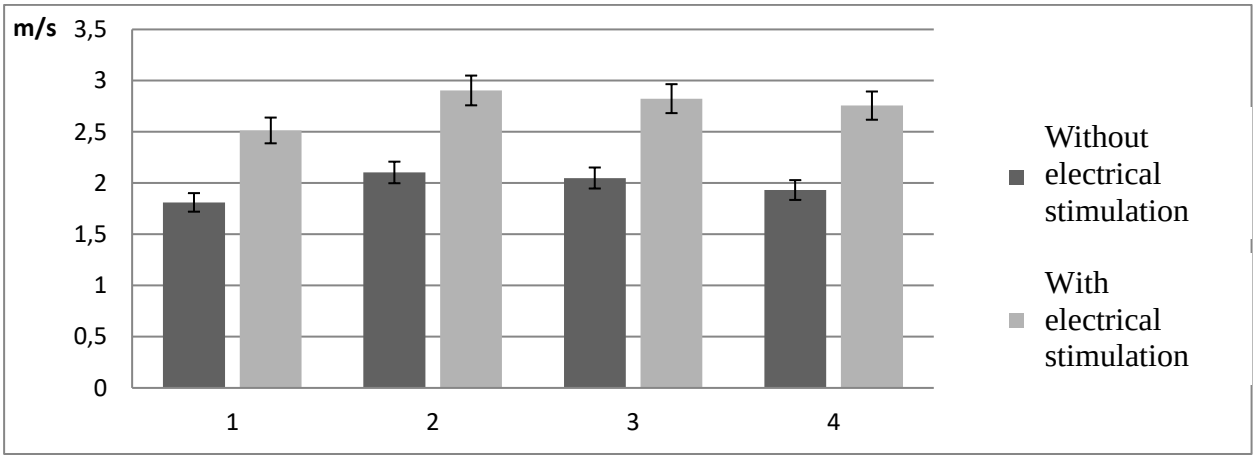

Figure. 2. Knee anthropometric point speed along the vertical axes during fly phase, m/s.

The electrical activity of the muscles in the performance of centrifugal actions for all cycles was reduced in the muscles of the thigh and lower leg, and in the pelvic muscles on the contrary increased. Thus, the average amplitude of the biopotentials of the muscle straining the broad fascia of the thigh is 29.9% higher when running with stimulation compared to running without electric influence. The muscle straining the broad fascia is involved in hip flexion, its increased activity in the Mach phase when running with stimulation increases the speed of movement of the upper tibial anthropometric point. The increase in the amplitude of biopotentials also occurs in the gluteal muscle, where the average value of bioelectric activity over the entire distance when exposed to transcutaneous electrical stimulation of the spinal cord is 15.8% greater than the value without stimulation.

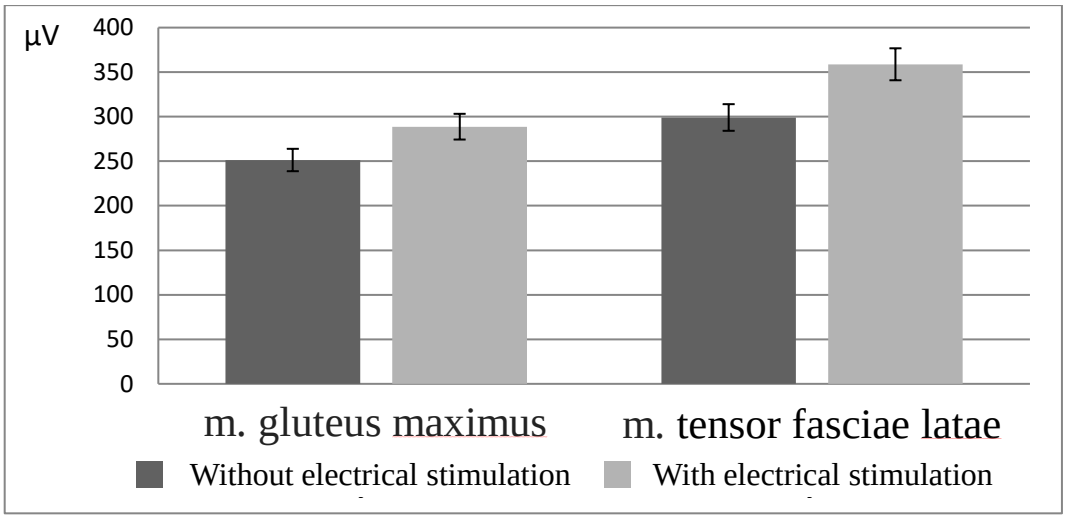

Figure 3. Pelvic muscles EMG activity average values during fly phase

3. Discussion and conclusions

Neurophysiological studies have shown that rhythmic activity in the descending pathways is formed mainly on the basis of signals from the spinal locomotor generator. On the basis of information on its activity adequate supraspinal influences on activity of spinal mechanisms are carried out. The signals of the locomotive generator provide information about the phase of the locomotive cycle. Thus, it can be assumed that when using transcutaneous electrical stimulation of the spinal cord on the background of arbitrary movements, complex neural interactions are formed, due to both supraspinal influences, and additional activation of the generator of stepping movements, allowing more effective use of intermuscular coordination in the implementation of motor tasks.

Transcutaneous electrical stimulation of the spinal cord allows you to use the backup capabilities of the neuronal circuits of the spinal cord when performing cyclic movements with maximum speed. During running with continuous electrical stimulation of the spinal cord coordination structure of motor actions is not violated, which gives reason to use this method as an additional means of improving the functionality of runners for short distances

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Gait analysis of patients with Parkinson's disease in relation to apposite data selection.

Ondřej Sitek[1,2], Miriam Kalichová[1], Petr Hedbávný[1], Marek Baláž[2] and Tomáš Boušek[2].
[1] Department of Kinesiology, Faculty of Sport Studies, Masaryk University, Brno, the Czech Republic
[2] 1st Department of Neurology, St. Anne's University Hospital, Faculty of Medicine, Masaryk University, Brno, the Czech Republic

Abstract

In Parkinson's disease (PD) patients, the motor symptoms (tremor, freezing of gait) fall within the ones with the most deteriorating impact on quality of life. In order to introduce our unique intervention programme based on exercise with vibration rings, we must clarify what motion variables are apt to be followed and evaluated. This pilot study aims to determine the most fitting variables for the long-term observation of the motor development influenced by the intervention programme.
We examined 11 individuals (4 females, 7 males, 63.76 ± 10.33 yrs) diagnosed with PD. We performed 3D kinematic gait analysis (5 trials × 7 m) using the SIMI Motion system. For each individual, 15 anatomical points of the body were marked and, subsequently, 105 spatio-temporal characteristics of locomotion were evaluated. Variability and correlation between the variables were evaluated, as well as the degree of lateral asymmetry. Factor analysis was used for variables number reduction. The most suitable variables for assessing the developing effect of the intervention programme are the single and double support time and other gait time variables. The variability of the gait model can be determined by 71 %; the greatest significance is distributed between three factors: F1 – gait time parameters, F2 – lower limbs segments angles in initial and terminal contact with the ground, and F3 – gait velocity parameters and step dimensions. For the upcoming research, the time variables are the most suitable thanks to their optimal variability. The factor analysis enables fusion of analysed variables; the low level of side asymmetry in key variables authorises us to omit its influence on the gait model in PD patients. The balance abilities of the patients need to be questioned and measured in the upcoming research, for further interpretation of the data.

Key words: Asymmetry, factor analysis, kinematic analysis, neurodegenerative diseases, stride

1. Introduction

Parkinson's disease (PD) is a progressive neurodegenerative disorder caused by loss of dopaminergic neurons in basal ganglia and is histologically manifested by formation of abnormal proteinaceous spherical bodies called Lewy bodies (Sveinbjornsdottir, 2016; Shukla et al., 2019).

The most common symptoms of the PD include motor difficulties such as rest tremor, muscle rigidity, bradykinesia, fatigue, and postural instability (Herlofson & Kluger, 2016; Sveinbjornsdottir, 2016; Shukla et al., 2019). Many patients also suffer from problems in turning, movement initiation and so called freezing, a state of sudden freeze in the middle of move (Bloxham et al., 1984; Plotnik et al., 2005). Besides the motor symptoms, the disease also manifests by non-motor symptoms, such as dementia, anxiety, depression or insomnia (Sveinbjornsdottir, 2016; Shukla et al., 2019).

The disease typically onsets in elderly people (60 +), epidemiologic studies recognize increasing prevalence of PD along with increasing age, the highest prevalence in age of 80 + exhibits as high as 1,9% (Pringsheim et al., 2014).

Recent medicine does not recognise any available cure of the disease; the routinely applied treatment splits into pharmacologic treatment (levodopa, dopamine agonists, MAO-B inhibitors) and surgical intervention (DBS – deep brain stimulation), whilst both concentrate merely on battling the symptoms. Usually, the treatment effect declines in the course of the disease progression (Baláž and Rektor, 2008; Herlofson and Kluger, 2016).

To enhance the positive effect of the treatment, the patients are encouraged to partake in complementary intervention programmes (IP), often tailored to the specific needs of the patients (Tomlinson et al., 2013). Presently, there exist plenty of specialised IP, reaching from physiotherapy or exercising to dance and martial arts. The programmes aim to increase both physical (balance and strength) and mental (habituation of model movements) capacities of the patients (Tomlinson et al., 2013). To quantify the effect of the IP on the selected parameters, it is typically accompanied by concurrent measurement that monitors the development throughout the IP (usually from the baseline up to several follow-ups). As such, motor tests are being applied that encompass sundry methods of gait analysis (e. g. step length, cadence, speed; Trew and Everett, 2005), questionnaires that track changing quality of life (e. g. PDQ-39; Jenkinson, 1997), functional mobility and balance scales outcomes (e. g. Timed Up and Go Test; Podsiadlo and Richardson, 1991), clinician-rated impairment and disability measures (e. g. UPDRS; Poewe et al., 2003), et cetera (Tomlinson et al., 2013).

A fresh and yet only little researched IP with reportedly great potential is an exercising with vibration rings; its positive effect is presumed by Volc (2012) and supported by multiple organisations that aim for caregiving and managing the IP for the PD patients (Parkinson klub Zlín, Klub Parkinson-Help Praha, Helping People with Parkinson's). Specifically, based on the patients' testimonials, coaches' reports and some theoretical works (Gunsh, 2007; Tomlinson

et al., 2013), exercising with the vibration rings improve both static (balance) and dynamic (turning, walking) characteristics of the PD patients.

Our main research interest concentrates on the vibration rings IP that is expected to improve the motor and balance capacity of the patients. Nevertheless, prior to the IP launching, it was crucial to determine the apposite motor variables suitable for the long-term observation of the PD patients' motor development. The determination of the variables is the primary matter of the hereby presented pilot study. Furthermore, there are two aspects questioned with intention to describe to the utmost the acquired dataset: Is there a significant side asymmetry to be taken into account in the side-based variables? And finally, is it possible – and if yes then into what extent – to describe the total gait model variability in the specific research group of patients?

2. Method

2.1 Study Sample

The pilot study was executed through optical tracking (SIMI motion capture).

Within the study, the locomotion of 12 PD patients (4 females, 7 males, 63.76 ± 10.33 yrs) was recorded and analysed. The patients were recruited by cooperating neurologists of the 1st Department of Neurology, St. Anne's University Hospital, Faculty of Medicine, Masaryk University, Brno. The discrimination for the recruitment was a diagnosed PD with L-dopa treatment. PD patients were excluded in a case of brain surgery undergone in past or in a case of clinically significant gait disabilities (i. e. caused by diabetes mellitus, rheumatic or orthopaedic disease or dementia).

The socio-economic status of the sample was not a subject of investigation.

2.2 Recording Method

The matter of our interest for the pilot study was the locomotion of the study sample. The PD patients' normal gait was recorded using optical tracking method. SIMI Motion capture is a marker-based optical tracking method; the recorded subjects are provided with reflexive markers which are scanned by an infrared imaging camera network.

The recording took place in Biomechanics laboratory at the Faculty of Sports Studies, spacious enough to perform several complete gait cycles. There were 8 infrared imaging

cameras arranged around to a cuboid of overlapping vision. The dimensions of this cuboid were approximately 8 m x 4 m x 3 m. The optical tracking accuracy of measuring was estimated as 0.25 cm.

Onto each participant, 15 anatomical points of the body (including extremities and head) were marked with the markers. The simple motor task for all the participants was a normal walk (i. e. to maintain normal speed, cadence, posture, et cetera) within the measured corridor. The discriminating criterion for one attempt to become analysis-accepted was to record at least 2 full gait cycles per attempt without noticeable record noise. All the participants performed 5 full attempts. The processing software collects the data from the cameras and processes them for analysing outputs (Matlab, Excel).

2.3 Data Evaluation

Past the recording, 105 of time, length, angular and speed parameters of locomotion per participant were acquired and evaluated. Data normality tested using the Shapiro-Wilk test, was typically not confirmed. The basic descriptive statistics was obtained. The paired samples t-test was performed to identify a degree of side asymmetry of the side-based parameters, in other words, whether it is apt to track the asymmetry of the PD patients' gait. A coefficient of variation was computed to provide outlook over the variables and to indicate the variables that could well be followed in the subsequent research. A factor analysis was performed to better describe the monitored variables and, if possible, to reduce them. The factor analysis was computed from a combined variables' sample where both sexes and both hand sides and all attempts were stack together; the total sample size for the analysis was 120.

The statistical methods were estimated at the 95% confidence interval.

3. Results

In total, the optical tracking has acquired 105 motor parameters per participant, from which 72 were of angular, 16 of speed, 13 of time and 4 of length variables.

To reduce and interpret the recorded data we concentrated on three domains: asymmetry and variability of the parameters and proportion of the specific parameters within e total gait model (through factor analysis).

Based on Mann-Whitney U test, there were no significant sex differences recognized, therefore both sexes were kept as one homogenous file.

3.1 Gait Side Asymmetry

The gait side asymmetry analysis was performed through paired samples t-test. The intraindividual side asymmetry proved some, although insignificant, tendencies. An asymmetry significant throughout the group was found in two parameters: trunk rotation along longitudinal body axis (as defined by frontal plane – sternum – shoulder) during the initial ($p = .000$) and terminal ($p = .020$) contact with the ground.

As the right- and left-hand side parameters evinced low level of side asymmetry, they were merged, forming a more robust dataset for the further analyses.

3.2 Variability of the Motor Parameters

In order to further reduce a great number of variables, a coefficient of variation was computed (see **Hiba! A hivatkozási forrás nem található.**). Based on low level of side asymmetry, both right- and left-hand side were merged. The parameters' variability covered a broad spectrum from 1.55% (hip angle of a standing leg during the terminal contact of the opposite leg) to 81.51% (arm angle during initial ground contact of the same-side leg). The time parameters exhibited the lowest variability (up to 13.97% in double-support time).

Table 1. Variability of the motor parameters computed as coefficient of variation. Both hand sides are merged. “I” stands for a moment of initial foot–ground contact. “T” stands for a moment of terminal foot–ground contact. “S” stands for an angle measured in the same-side limb that initiates/terminates the ground contact. “O” stands coefficient for an angle measured in the opposite-side limb than which initiates/terminates the ground contact. “COG” stands for Centre of Gravity, “v” stands for velocity, X, Y and Z represent particular axis of move and “abs” stands for absolute velocity as a resultant of X, Y, Z velocities.

Speed variables	**Variability (%)**	**Angular variables**	**Variability (%)**
T COG v (Y)	9.04	TO hip α	1.55
T COG v (abs)	9.18	TS hip α	1.74
I COG v (abs)	13.49	IS knee α	2.17
I COG v (Y)	14.03	TO hip α	2.27
T COG v (Z)	44.95	IS hip α	2.37
I COG v (Z)	45.54	TO elbow α	2.91
T COG v (X)	60.52	IO knee α	3.26
I COG v (X)	70.31	TO knee α	3.80
Time variables	**Variability (%)**	TO ankle α	4.23
Stride time	3.28	TS knee α	4.38
Walking cadence N/s	3.32	TS ankle α	5.65
Single-support time	7.36	TS elbow α	6.38
Single-support time %	7.69	TS elbow α	6.39
Step-time	9.22	IS elbow α	7.13
Double-support time %	13.61	IS ankle α	10.88
Double-support time	13.97	IO hip swing α	17.89
Length variables	**Variability (%)**	TO arm swing α	22.87
Step length	9.66	IS hip swing α	25.27
Step width	17.55	TO hip swing α	26.73

T Trunk lean	52.37	IO arm swing α	27.51
I Trunk lean	70.65	TO knee swing α	30.32
		TS arm swing α	34.73
		TO ankle swing α	38.62
		TS hip swing α	40.34
		IO knee swing α	42.26
		IS knee swing α	43.17
		TS knee swing α	44.85
		IO ankle swing α	50.10
		IS ankle swing α	50.74
		TS ankle swing α	54.36
		I trunk rotation α	64.09
		IO ankle α	68.00
		T trunk rotation α	72.38
		IS arm swing α	81.51

3.3 Reduction of Parameters

Finally, the factor analysis was executed to interpret and reduce the data (**Hiba! A hivatkozási forrás nem található.**). The variability of the gait model was determined by 71%; the greatest significance is distributed between four factors: F1 – gait time parameters (16%; the lower step cadence, the longer gait cycle phases), F2 – lower limbs segments' flexibility (14%; the lower limb joints' interconnection in terms of angular reach, i. e. the joints' flexibility or rigidity is linked), F3 – forward motion (9%; the higher the velocity, the longer the steps) and F4 – sagittal swing of pelvis (6%; a pelvis position participation on the lower limbs' angles).

Table 2. Variability of the gait model described through factor analysis. Both hand sides are merged. “I” stands for a moment of initial foot–ground contact. “T” stands for a moment of terminal foot–ground contact. “S” stands for an angle measured in the same-side limb that initiates/terminates the ground contact. “O” stands for an angle measured in the opposite-side limb than which initiates/terminates the ground contact. “COG” stands for centre of gravity, “v” stands for velocity, X, Y and Z represent particular axis of move and “abs” stands for absolute velocity as a resultant of X, Y, Z velocities. The red variables belong to the corresponding factors.

	F1 – gait time parameters	**F2 – lower limbs segments flexibility**	**F3 – forward motion**	**F4 – sagittal swing of pelvis**
Parameter	**Factor Analysis Value**			
I COG v (X)	0.2221	-0.1507	-0.2299	0.0223
I COG v (Y)	0.5043	-0.1087	-0.7859	0.075
I COG v (Z)	0.3232	0.0194	-0.0466	-0.3531
I COG v (abs)	0.5249	-0.115	-0.7801	0.0591
I trunk inclination	-0.4724	-0.0357	0.1465	0.0387
I trunk rotation	0.0096	0.9472	0.1287	-0.0406
IS elbow α	0.5795	0.0032	0.0928	0.2989
TS elbow α	0.1353	0.0571	0.2443	-0.0829
IS hip α	-0.2432	0.1553	0.1452	0.6529
TO hip α	0.047	-0.0301	-0.0587	0.2324
IS knee α	-0.1221	-0.0899	-0.1551	0.6755
IO knee α	-0.2101	-0.078	0.0309	0.1184
IS ankle α	-0.2616	0.284	-0.1795	0.1289
IO ankle α	-0.0886	-0.0402	0.1302	0.0916
IS arm swing α	0.0288	0.0616	-0.1136	-0.0161
IO arm swing α	0.0059	-0.4131	0.2717	-0.2883
IS hip swing α	0.0085	0.797	0.0192	-0.0613

IO hip swing α	-0.0928	-0.2049	0.1136	-0.0615
IS knee swing α	0.0696	0.701	0.1803	-0.2161
IO knee swing α	0.0347	0.2806	0.1947	-0.6399
IS ankle swing α	-0.2574	0.818	0.0833	-0.0563
IO ankle swing α	-0.1679	0.8437	0.062	0.0832
T COG v (X)	0.2156	0.0158	-0.2638	-0.0847
T COG v (Y)	0.5167	-0.1656	-0.7374	0.0106
T COG v (Z)	0.587	0.0488	0.0144	0.4199
T COG v (abs)	0.5282	-0.1603	-0.7321	0.0187
T trunk inclination	-0.2734	-0.2179	0.251	0.205
T trunk rotation	0.0359	0.951	0.1147	-0.008
TS elbow α	0.3814	0.0349	0.2313	0.1593
TO elbow α	0.4056	0.0158	0.0653	-0.048
TS hip α	0.0966	0.1548	-0.235	0.4783
TO hip α	-0.3301	0.1458	0.2539	0.3628
TS knee α	-0.1143	-0.0159	0.0591	0.6672
TO knee α	-0.1824	-0.0908	-0.002	0.1056
TS ankle α	-0.247	0.002	-0.5734	0.1381
TO ankle α	-0.1807	0.5071	-0.2396	0.0445
TS arm swing α	0.096	-0.6298	0.1129	-0.3247
TO arm swing α	-0.0252	-0.0358	0.2311	0.0162
TS hip swing α	0.0602	0.1692	0.0641	0.0484
TO hip swing α	-0.0759	0.5274	-0.0323	0.1473
TS knee swing α	0.1631	0.796	0.0766	-0.0756
TO knee swing α	-0.1002	-0.4695	0.1215	-0.5421
TS ankle swing α	-0.4584	0.3701	0.0016	-0.1317
TO ankle swing α	-0.2607	0.8117	0.0769	0.1826
Step time	-0.9254	0.0249	0.1015	0.042
Stride time	-0.9552	0.0229	0.1425	0.0399

Double-support time	-0.8011	0.136	0.3321	-0.0379
Single-support time	-0.8278	-0.1143	-0.0411	0.1071
Double-support time %	-0.4306	0.2654	0.4857	-0.0482
Single-support time %	0.4527	-0.2545	-0.3612	0.0957
Walking cadence N/s	0.9376	-0.0794	-0.1748	-0.1095
Walking cadence N/min	0.9376	-0.0794	-0.1748	-0.1095
Step length	-0.0677	-0.0542	-0.8882	-0.0424
Step width	0.087	-0.287	-0.2515	0.1515
Eigenvalue	**8.7394**	**7.8144**	**4.9803**	**3.4143**
% of variance	**16.18**	**14.47**	**9.22**	**6.32**

4. Discussion

Compared to studies directly aiming in asymmetry assessment, our sample exhibits low level of side asymmetry. Plotnik et al. (2005) and Yogev et al. (2007) found substantial side asymmetry in PD patients compared to a healthy control group, being more pronounced in the patients with freezing of gait. Furthermore, the asymmetry was endorsed by higher speed and cognitive loading. The authors, however, used a different walking protocol as their subjects walked for a total of 80 m in a row whereas our method-limited group was instructed to walk 5 times 8 m with a short rest time between the trials. Having the rest may explain the less pronounced level of side asymmetry in our sample. Boonstra et al. (2014), who found side asymmetry in PD patients significant, also concentrated on different side asymmetry: their trial aimed to a balance control asymmetry in the patients standing on a force plate.

By contrast, in our study, the only significant asymmetry was found in trunk rotation along longitudinal body axis during the initial and terminal contact with the ground. Given the substantial differences in the asymmetries found by other authors, the asymmetry for the upcoming research will be addressed again, using a longer-walk protocol.

Fluctuating variables with high variation coefficient (over 12%) are considered inappropriate for comparisons as they may be based on individual moving patterns (Gabell and

Nayak, 1984). The most rigid variables, as we suppose, could as well be resistant to the IP effect.

Hausdorff et al. (1998) researched the gait variability in PD patients and proved greater variability in time variables (double-support time, stride time, swing time and step time) in PD patients compared to healthy control. Gabell and Nayak (1984) studied gait variability in 64 healthy subjects (32–84 yrs.) and found balance parameters (stride width and double-support time) more variable (17–27%) than the gait-patterning mechanisms (step length and stride time; variability below 6%). Our study yielded slightly different results: the stride width and double-support time reached 13.97% and 17.55% and the step length and stride time reached 3.28 and 9.66%. Another study, Öberg et al. (1993), proved a lower variation coefficient on a big sample of 233 subjects (10–79 yrs.) in walking cadence (5–9%) and step length (5–11%) than in gait speed (7–15%). In our study, the results were similar (walking cadence 3.32%, step length 9.66%, gait speed in terminal and initial ground contact 9.18% and 13.49% respectively).

The variation coefficient among the studied parameters extended from 1.55% to 81.51%. As the majority of the variables of variation coefficient were over 12% and the most rigid variables were excluded, the suitable variables for the future research were reduced from 53 to 23, mostly consisting of generally less fluctuant time and speed variables. Most importantly, the stride time (var. coef. 3.28%) and step length (var. coef. 9.22%) were appointed especially suitable for the main research.

The factor analysis as a method to describe variability of the gait in elderly people was pursued by Hollman et al. (2011). Their most extensive factor F1 (25.8% of the variance in gait performance) which they entitled “rhythm factor”, embodied variables such as single-support time, stride time and cadence, the same variables that comprised our F1 factor “gait time parameters” (16.18%).

Based on the factor analysis, the parameters with medium variability (taken from the variation coefficient) were selected as the representative parameters for the whole factor (for overview of the representing variables see the greyed variables in **Hiba! A hivatkozási forrás nem található.**). As such, the stride time, single- and double-support time were selected representing F1 (“gait time parameters”). The single- and double-support time are useful parameters to follow the development of balance abilities caused by IP. As Protokinetics team (2018) indicates, the greater the balance problems, the greater the ratio of stance phase. An improved balance in PD patients caused by IP is supposed to lead to optimising the swing and stance phase ratio.

The factor F2, “lower limbs flexibility”, has been found inappropriate for subsequent following due to a high variability of the detected variables (25.27–72.38%).

The step length and gait velocity (I COG v (abs)) were selected representing F3. Although the gait velocity exceeded the recommended variation coefficient (13.49% > 12%), the difference is not prominent; as it rather substantially contributes to the factor, it will be addressed as well. Furthermore, it relates to the F1 (“gait time parameters”), as Protokinetics team (2018) points out: “Proportions of the different phases vary in changes with speed.” The ratio of the single- and double-support phase represents the key parameter in the F1. In other words, the changes in single-/double-support phase ratio are favourable to correlate to the changes in gait velocity.

The last important factor F4, “pelvic swing”, is represented by a hip angle in the limb making the initiation ground contact (IS hip α). The factor is based on angular characteristics in hips and knees that coactively portray the pelvic swing during the gait. The variability of most of the angles is very low (below 5%). The reason for selecting the hip angle variable is its high influence on the whole factor. From the kinesiologic perspective (Bernaciková et al. 2010; Němec, 2013), the hip angular extension directly influences a rate of the flexion and extension of knees leading to a mass transmission from one leg to another during the double-support phase.

Based on the discussed results, we will track an impact of the IP on the motor development mostly in speed and time parameters as well as some angular parameters (see the greyed variables in **Hiba! A hivatkozási forrás nem található.**). Although the double-support time surpasses the recommended variation coefficient (13.97% > 12%), the difference is not high; for the comparative reasons it will be traced as well.

The selected variables are in congruence with Tomlinson et al. (2013) who reported the greatest IP effect being detectable using speed (e. g. Mak and Hui-Chan, 2008; Fisher et al., 2009) and two- or six-minute walk test (e. g. Hackney and Earhart, 2009; Schilling et al., 2010). Stride time and step length (Gabell and Nayak, 1984; Öberg et al., 1993) and walking cadence (Öberg et al., 1993) will be addressed as well.

Furthermore, Klassen et al. (2007) and Schilling et al. (2010) followed the development in Timed Up and Go test and Cakit et al. (2007) tracked Berg Balance Scale. Those tests will also be included to our main research, as Tomlinson et al. (2013) proved them being good indicators of functional mobility development.

The variables of stride time, single and double-support time, step length, I COG v (abs) and IS hip α will also substitute three of the detected factors.

However the applied optical tracking method issued fruitful results, it cannot describe all the important aspects of balance abilities in the PD patients, as being developed owing to the IP (Tomlinson et al., 2013). The balance abilities include a dynamic balance when walking, and a static stability during stance. Both the modulations bear a better evidence about the planned IP effect. That is why a more suitable method of stabilometry (Zebris force plate) and complementary accelerometry will be administered as main methods for the following research. The both methods together maintain the suitability for measuring the apposite variables appointed within the pilot study.

5. Conclusion

The pilot study searched for the most apposite variables in PD patients' gait to bring the adequate information on the gait development triggered by the vibration rings IP. After determination of the apposite variables, the IP may commence. Selected time and speed variables were shown to best access the challenges brought by the future research.

The effect of the IP will be studied using a different method compared to the present pilot study, to our belief better solving the designed questions without losing the good evidence capacity.

We expect the IP to improve both the motor and balance capacities of the participants. Seeing further, we believe the IP could become a great boon for the PD and other motor-impaired patients and improve the quality of life among the elderly population.

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Running race and fundraising - general characteristics of peer-to-peer fundraising in Hungary.

Zsuzsanna Gosi and Zsuzsanna Bukta,
Institute of Health Promotion and Sport Science, Eötvös Loránd University, Hungary.

Abstract

This study presents the general characteristics of peer-to-peer fundraising through running events. This kind of fundraising usually involves some kind of physical performance, of which, running is considered as the most popular. The advocates make a commitment to assist an organization in fundraising both by their own personal donations, and by encouraging their peers to do the same. We have examined the subject by the help of a questionnaire survey, in which we looked for answers to general donation concerns as well as volunteering issues. The majority of the respondents donate regularly. The amount of annual donations is consistent with the results of nationwide surveys. The responses given to the survey illustrate, that committed fundraisers are able to successfully share the message with their peers.

Keywords: *recreational sport, running race, charity, fundraising, peer-to-peer fundraising*

1. Introduction

Popularity of recreational sports has increased consistently in the last couple of decades. In parallel with that, the number of urban running events and their participants also show an increasing tendency. Charity is also inherent in sports for a long time. The so-called peer-to-peer fundraising gains more and more popularity, especially concerning running races. In this case, the purpose of the athlete is to raise the awareness of his followers to a specific charitable situation, while encouraging the same group of people to financially donate to the chosen purpose of organization.

2. Recreational Sports

When approaching recreational- and professional sports from an economic angle, we find the following definition: a recreational sportsman is someone involved in sports activity in order to experience its positive effects upon his/her health and well-being (Szabó, 2009). During the 20th Century, the previously strict understanding of recreational sports activities has extended

into a wider meaning content, and recently, this interpretation is further expanded by several factors (Sárközy, 2002). Healthcare has also extended the role of sports, concerning the aspects of prevention and recreation (Nagy, 1995).

Overall recreational sports habits and physical activities of Hungarian population are presented in the most comprehensive manner by a research conducted in the European Union in every four years. Figure 1 presents the data of this research. According to this, the sporting intentions of Hungarian population have changed in a negative manner. The number of people who is never, or only seldom involved in any sports activity has increased, and in parallel with that, the rate of people involved in regular sports activities has decreased.

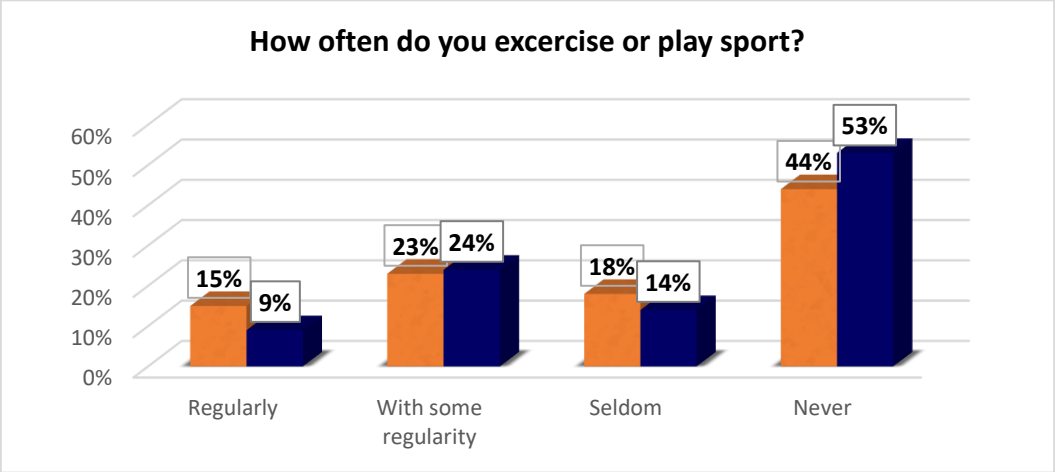


Figure 1. Sporting habits of Hungarian population 2013, 2017. (Source: Eurobarometer 2018, respective edit).

3. Street running

In the next paragraph, I introduce running as a sport with a couple of thoughts. The reason for this, is that our chosen fundraising method is the most widespread in this sport. Natural movements, like walking, running, jumping, throwing were already practiced in the prehistoric ages (Gallovits et. al, 2011). The popularity of running comes from the fact that there are opportunities almost everywhere to exercise ourselves in this activity. Jogging was introduced into American culture by James Fixx (Cselik, 2015). Today, street races for running are extremely common, with their distance varying on a large scale. The breakthrough in making marathon running a grassroots sport was achieved by Fred Lebow of Hungarian descent, who finally made amateur runners understand that within certain limitations, everyone is able to run along the distance of the marathon without any special abilities (Felsofokon, é.n.). An

interesting fact, that the Sports Office of Budapest has chosen the phrase “distance to be overcome” in case of some half-marathon races.

In 2018, a research consisting of 2000 elements was conducted concerning the sporting and sports-consumption behaviour of Hungarian population (Törőcsik & Csóka, 2018). 433 of the respondents was involved in any sports activities. The most popular choice were gym activities (20.36%) while running (17.6%) came in second. The research was also extended to create a pyramid of brands concerning several sports. Running, according to the numbers of the research, is ranked number one, as the occasionally most practiced sports activity (Törőcsik & Csóka, 2018). Another investigation concerning sports attitudes from the aspect of athletics, concluded that running is also a strong communal activity. According to the responses, the participants considered themselves to be in good atmosphere and company. (Hargitai, 2016)

In the recent decades, the greatest running events in Hungary were organized by the Sports Office of Budapest. According to the number of participants, three of these stand out from the rest: the Vivicitta Preservation Run, Budapest Half-marathon, and Marathon Festival. Two of these three events have been extended into two days duration, for the sake of smooth operation. As typical, shorter distances are held on Saturdays, while Sunday hosts the longer distance runs. Recently, these events include some fundraising races too. (Gősi et al., 2019).

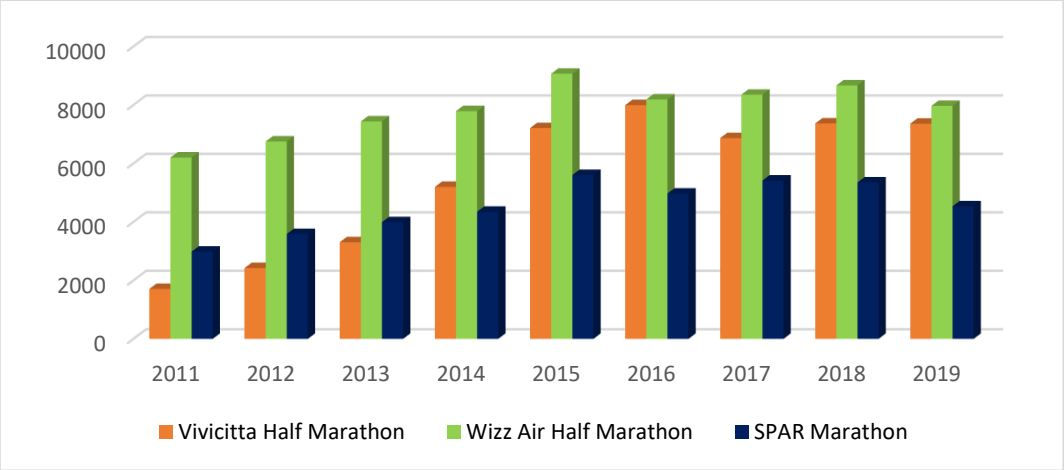


Figure 2. Number of participants completing the longest distance at the running races organized by BSI. Source: futanet.hu / eredménylisták; respective edit [1]

Figure 2. presents the number of participants completing the longest distance. The figure clearly indicates the stagnation in the number of participants during the last 3 years, in contrast with the obvious growing tendencies seen at each of the races until 2015. Concerning

[1] The number of participants is higher than that, as particularly at long distance races, certain part of the candidates cannot complete the whole distance.

the gender of participants, at shorter distances the majority is consisted of women, while at longer distances and especially at marathon races, men clearly outnumber women. Age group analysis shows that at the events organized by the Sports Office of Budapest between 1999 and 2012, almost two third of the participants are under thirty years. However, the participation of older age groups, especially the rate of people above fifty years shows an increasing tendency year by year (Seres, 2012).

4. Charity, sponsorship, volunteering

Volunteering and sponsorship, as well as peer-to-peer fundraising are all subject to individual responsibility. There are two known dimensions of it. One is Self Personal Responsibility, while the other one being Individual Social Responsibility (Nárai & Reisinger, 2016). The meaning of Self Personal Responsibility is that the citizens take the responsibility for their own life. This includes living a lifestyle appropriate for physical-psychical welfare, tending of family environment, followed by paying attention to such direct environments as family or any other micro-environment. Individual Social Responsibility means stepping out of private personal spheres in order to take responsibility for closer or wider general environment.

Social responsibility includes the individual responsibilities of volunteering and sponsorship. In a most general sense, charity means the selfless provision of aid. Charity can be simple volunteering, but can also appear in the form of donations offered to groups or individuals in need, as well as to charity organizations (Czike & Kuti, 2006).A volunteer can either work as a “laic helper”, or by using his/her professional knowledge in order to help the development of certain communities (Nárai, 2012).

5. Donations

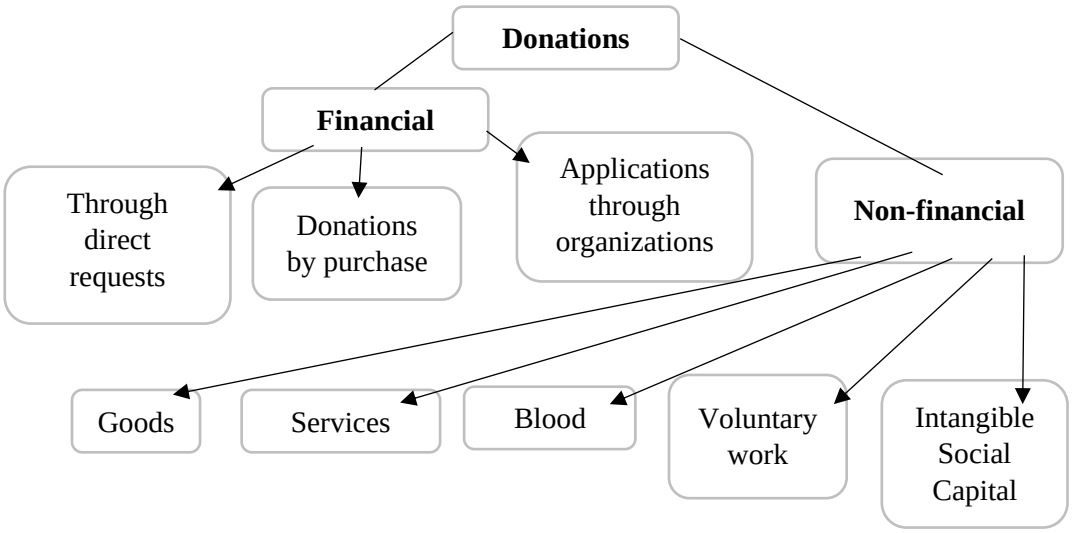


Figure 3.- forms and types of donations (Arapovics, 2013)

Donation is a form of support either in financial or non-financial goods, offered for non-government- or non-profit organizations, denominations, public institutions as well as to individuals outside of their family or friendship spheres freely, without remuneration Donations can be offered either by organizations or by individuals. Types and forms of donations are listed in figure 3.

6. Sports and Social Responsibility

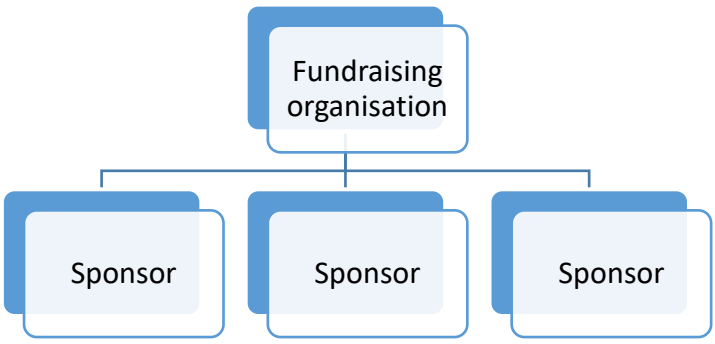
In modern societies sports have become an integral, almost substantive part of economy. Its role in society however, is more complicated than this. Its role of mediating values is present in many scenes. One of the central elements of professional sports is the idea of fair play (Kassay, 2017; Kassay, 2019). In Hungary, the greatest traditions and popular base of voluntary work are connected to headline sports events. These events mobilize a plethora of young sports advocates (Onyestyák & Kállai, 2013). Among young people, school and University sports are also important areas of voluntary work (Bácsné Bába et. al, 2018). In this case, we can consider friendly atmosphere, love of sports and the opportunity for teamwork as highlighted motivational factors. This manifold complexity is supplemented by various charity sports events and methods of fundraising.

7. Peer-to-peer Fundraising

In case of peer-to-peer method, the fundraising is initiated by people committed to the given organization or cause. In this case, the advocates undertake individual challenges, such as running or swimming a certain distance – it can actually be a commitment to any personal, usually physical activity. The act of commitment is actually a communicational opportunity for the campaign. The advocates spread the news in their social circles, while requesting donations for the chosen organization. Thus, it is a highly personal genre, where credibility and immediacy have an enormous role during fundraising. Its greatest advantage is that news of the campaign can reach numerous new people. Figure 4. presents the difference between traditional fundraising and peer-to-peer fundraising.

Traditional fundraising

In Hungary, running races are definitive events of peer-to-peer fundraising. The amount of collected donations at these races is increasing on an annual basis. In 2018, two events were especially successful, the Telekom Vivicitta Preservation Run in spring, and the Spar Budapest Marathon Festival in autumn. While at the former event about 1000 peers have raised funds for 14 organizations, at the latter in autumn there were about 2000 active fundraising participants, collecting donations for 11 organizations. The collective amount of donations at these two events was almost 50 million Forints (BSI, 2018). The amount of separate donations shows an increasing tendency at the charity runs organized by the Sports Office of Budapest since 2008 (Gősi & Magyar, 2019). Apart from foot races there are several other challenges to undertake. The website of *jougyekert.hu* provides an online platform for these commitments. This platform helped to raise donations in more than 50 million Forints value (*jougyekert.hu*).



Peer-to-Peer Fundraising

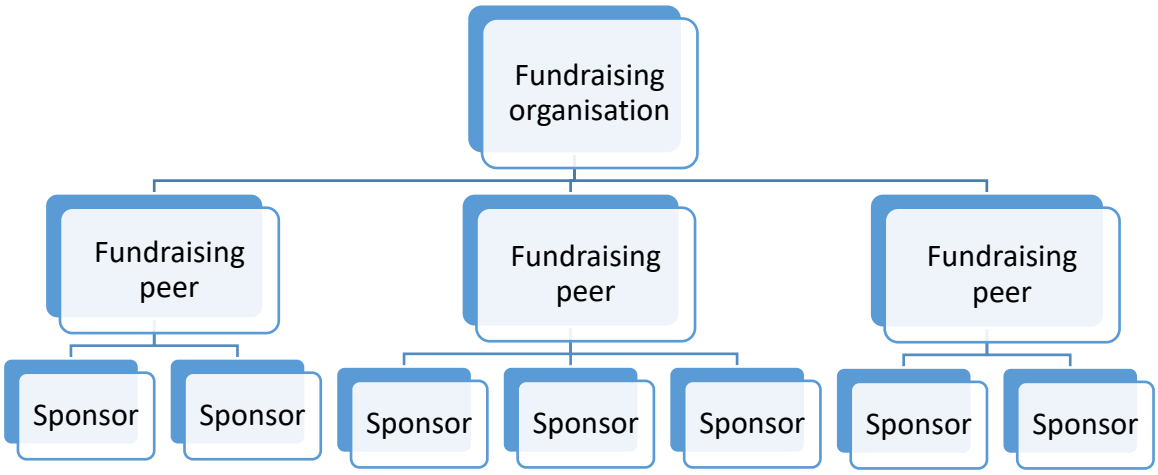


Figure 4. Difference between traditional and peer-to-peer fundraising (respective edit)

8. Questionnaire Survey

In order to provide a detailed explanation of the subject, an online questionnaire form had to be filled in, concerning questions about sponsoring, and especially peer-to-peer fundraising. The number of respondents was 150. Concerning regular, everyday donations, a little more than half of the respondents – 51.3% – considered him/herself involved. With our next question we examined the annual amount of donations. The most frequent response was between 1.000 and 10.000 Forints, marked by 42% of the respondents. 1.3% of all the people stated to donate more than 200.000 Forints annually.

We have also investigated the rate of people partaking in any event whose entry fee was partly or completely served charity purposes. The results are presented in figure 5.

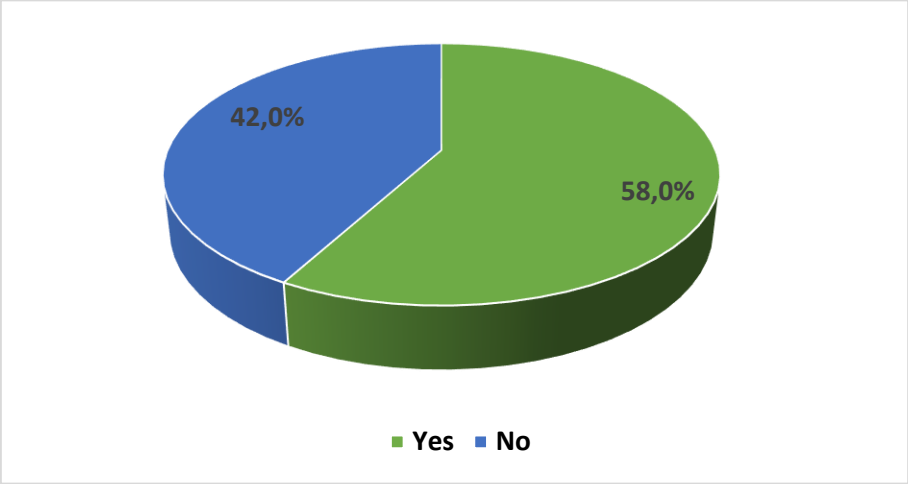


Figure 3. Participation on events, where the entry fee serves charity purposes. (Questionnaire survey, respective edit)

Besides general questions, we have analysed peer-to-peer fundraising in a more detailed manner. Peer-to-peer advocates participated mostly in foot races, a bit more than 60% of the respondents chose this option. Other sports mentioned were cycling, triathlon, swimming, canoeing, and handball. The beneficiaries of the fundraising were non-government organizations, mostly foundations. The two most often mentioned organizations were SUHANJ! (Glide!) Foundation, and Bátor Tábor Alapítvány (Camp Courage Foundation). It is worth emphasizing, that peer-to-peer fundraisers are regularly involved in this kind of activity instead of being only one-timers. These regular advocates either raise funds consistently to a certain organization, or choose various beneficiaries at these events.

Concerning fundraising campaigns, the participants used social media platforms to raise awareness. Among these, Facebook stands out as the most popular social media portal (figure 6.). Other responses include phone calls, personal emails, and direct conversation too.

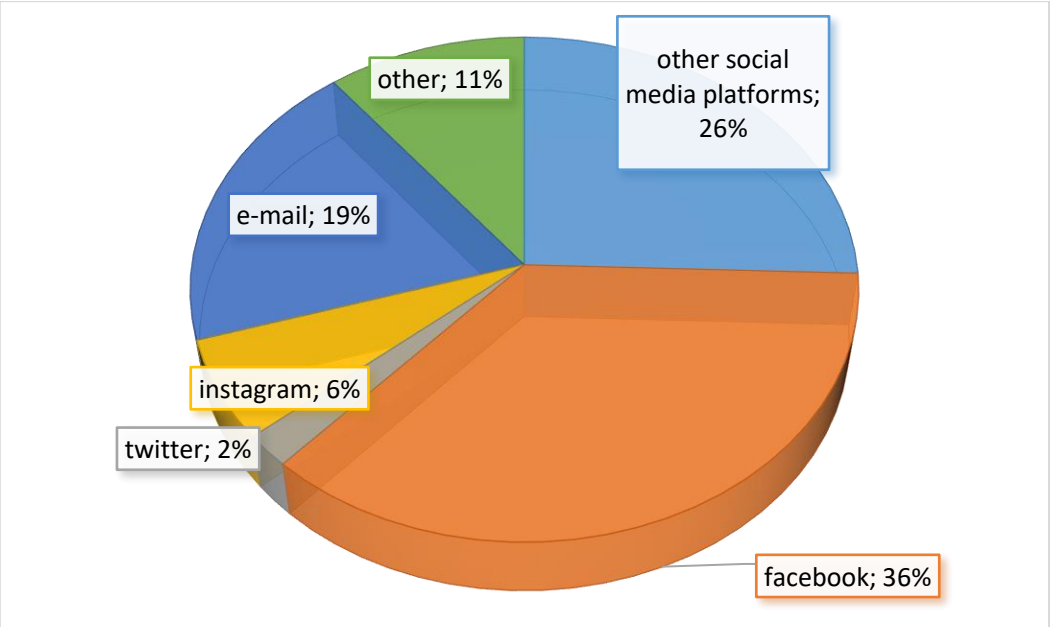


Figure 4. Methods of raising awareness to peer-to-peer fundraising

Source: Questionnaire survey, respective edit

Peer-to-peer fundraisers set out a goal, an amount to aim for, to be achieved. They constantly provide actual informations about its completion to their peers. More than 85% of the respondents replied that they were able to achieve their goals. However, the image is slightly tilted as these goals move on a quite extended scale from fifty-thousand to one million Forints. There are several strategic factors in peer-to-peer fundraising that are worth paying attention:

- The appeal for sponsorship should be brief
- It should contain as much facts as possible
- Should include emotions (Snow, 2011)
- It is worth raising awareness repeatedly,
- And to give thanks as often as possible (Cseh, 2018).

Altogether, the success of peer-to-peer fundraising highly depends on the commitment of the given person. He/She is the one to raise awareness to the campaign, and to collect funds using his/her own network of relations.

9. Conclusion, vision

This study provides a short insight to the characteristics of peer-to-peer fundraising in Hungary. The researches and surveys imply a small increase in sponsorship habits. However, the

collected data shows that there are still further possibilities to make charity and volunteering more popular in Hungary.

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Non verbal dimension of creative thinking test: a brief review.

Cristiana D'Anna[1], Pasqualina Forte[2], Vincenza Barra[1,] and Filippo Gomez Paloma [3]
[1]Department of Human, Philosophical and Education Science, University of Salerno, Italy
[2] Department of Medicine, Health Sciences, University of Molise, Italy
[3] Department of Education, Cultural Heritage and Tourism, University of Macerata, Italy
ORCiD: https://orcid.org/0000-0003-0216-0318

Abstract

The World Health Organization, identifies in the document Life skill education in school the fundamental psychosocial competences in order to effectively face the demands and challenges of everyday life (WHO, 1993). Creativity, that is the ability to look at problems or situations from different perspectives, finding solutions different from traditional ones, creating an unique and original idea or product (Guilford, 1950), is one of the life skills that in recent decades has gained increasing interest; in fact, it presents itself as a very topical yet complex subject to be investigated. The present study aims to select and compare evaluation tests of creative thinking validated in scientific literature that focus attention also on the non-verbal dimension of creativity. Relevant studies were identified by searching the Web of Science, Pubmed, Scopus and Science Direct databases.
The study wants to demonstrate, in the light of scientific evidence, that the non-verbal dimension of creativity, often little considered and investigated, is instead full of interesting information on the creative thinking of the child. The movement, the finalized action/the graphic design are elements united by the purpose of soliciting operational behaviours and mental behaviours, aimed at activating equally the dynamics of creative thought. The analysis of the literature shows that the study of the non-verbal dimension of creative thinking can be a useful investigative tool both to have a more complete picture of creativity and to analyse the potentialities through a channel, sometimes more developed than the verbal one and the resources of children with certified disabilities.

Key words*: Creative thinking, assessment, non verbal dimension, children, action and movement.*

1. Introduction

Studies on creativity, which started in the late 1800s, have changed the way of conceiving creative thinking. This change was the result of a vast scientific debate that involved different disciplines: educational, psychometric, psychodynamic, historic-cultural and neuro-scientific. Over the years, the evolution of scientific interest has developed increasingly in an interdisciplinary view with a strong impulse of studies since the 1950s which has marked a turnaround by expanding the attention not only on the productive capacity of the mind and the

so-called convergent thinking, oriented towards the solution of problems according to a univocal perspective, but also on divergent thinking, which allows to find open, partially completed and perfectible solutions with a dynamic and in progress characterization. (Biasi, 2018).

The studies of Guilford (1950,1959), those of Berlyne (1960) and Torrance (1966) date back to this period; studies that have given a strong impulse to research on creativity, assigning it a central role in the evolution of human culture throughout the world, which is proceeding thanks to intuitions and creative progresses (Hennessy & Amabile, 2010). The Organization for Economic Cooperation and Development (OECD) regards the development of creativity to be one of the most important objectives to be promoted by inviting schools to plan educational paths aimed at developing this useful competence for students to be able to face the innumerable and complex problems of current society.

The World Health Organization (WHO, 1993) identifies, in the document *Life skill education in school,* the fundamental psychosocial competences in order to effectively face the demands and challenges of everyday life. *Creativity*, that is the ability to look at problems or situations from different perspectives, finding solutions different from traditional ones, creating an unique and original idea or product (Guilford, 1950; De Bono, 1970); it is mainly a tangible competence, based on knowledge and practice, which allows individuals to improve themselves and achieve better goals. It is one of the life skills that in recent decades has gained increasing interest; in fact, it presents itself as a very topical yet complex subject to be investigated. It includes divergent/convergent and primary/secondary thinking methods as well as critical/analytical thinking processes, intuition, imagination, elaboration, creative outcomes, novelty and utility as well as certain personal and environmental factors (Barron & Harrington, 1981).

The creative potential acquires primary importance, because it is just through creativity that the individual expresses his personality. Therefore, creativity assumes a central position in the educational context because it performs both the function of expressive and research activity, capable of promoting self-awareness and guiding the child towards the personal and social use of knowledge. Reasoning with an inclusive perspective, creativity that also emerges through non-verbal language can be, not only a communication and action tool for the child, but a powerful means of developing functional skills for everyday life.

The study wants to demonstrate, in the light of scientific evidence, that the non-verbal dimension of creativity, often little considered and investigated, is instead full of interesting information on the creative thinking of the child. The movement, the finalized action and / or

the graphic design, for example, are elements united by the purpose of soliciting operational behaviors and mental behaviors, aimed at activating equally the dynamics of creative thought. The analysis of the literature shows that the study of the non-verbal dimension of creative thinking can be a useful investigative tool both to have a more complete picture of creativity and to analyze the potentialities through a channel, sometimes more developed than the verbal one and the resources of children with certified disabilities. Aim of this study has been t**o** select and to compare evaluation tests of creative thinking validated in scientific literature that focus attention also on the non-verbal dimension of creativity.

2. Material and methods

A literature search was conducted for articles and books published between 1960 and 2019. The literature review was carried out by the following databases: Web of Science, Pubmed, Scopus and Science Direct. The search terms used were creativity, creativity test, creative potential, non verbal dimension. The selection criteria of the articles and books included those that focus on creative testing that evaluate creative thinking through the non-verbal dimension (in action, in motion or graphically).

3. Results

Twenty tests evaluating motor creativity have been selected: fifteen of these were validated over a period of about thirty years from 1965 to 1996; another five of these in the years 2001-2011.

The tools were reported in the Table. 1, which briefly highlights the selected evaluation tests organized by year of validation, with bibliographic source, name of the tool and brief description of the study method.

Authors	Title	Synthetic description
Mednick (1962)	*Remote Association Test RAT*	In the RAT the operationalization of creativity occurs in associative terms. Subjects are asked to provide a term for each series presented that is in some way associated with three data terms.
Wallach & Kogan (1965)	*Creativity Test*	This test measures the generation of original ideas, emphasizing the importance of a gaming atmosphere rather than evaluative. Creativity is measured in terms of the number of associations and their originality: those who are more creative can find different uses and more original similarities between the objects presented in the test.
Calvi (1965)	*Test Expressions*	The test consists of graphical and verbal tests inspired by those required by Guilford. The test was not widely circulated probably due to gender, age and cultural variables.
Guilford (1967)	*Guilford's Alternative Uses Task*	Examiners are asked to list as many uses as possible for a common object in the house (such as a brick, a paper clip, a newspaper). The test measures divergent thinking.
Wyrick (1968)	*Test of Motor Creativity*	Four test items were devised for each of four motivators: rubber balls, parallel-lines, a red hoop, and a low balance beam. These motivators were designed to serve as stimuli for tests capable of differentiating individual ability to produce both number and uniqueness of motor responses in problem solving tasks of a motor nature.
Bonaiuto (1973) Biasi & Bonaiuto (2007)	*Creativity for continuity, opposition and detachment COD*	The COD test is a specific evaluation procedure that consider the influences of dynamic processes on creative processes.
Torrance (1974)	*Torrance Test of Creative Thinking TTCT*	It is a test of creativity for children, it measures the generation of original ideas through the request for the completion of schematic images. It is currently the most used psychometric tool to evaluate creativity from 5 years of age.
Torrance (1981)	*Thinking creatively in Action Movement TCAM*	Is a survey tool used to measure the abilities of creative thinking, favouring a kinaesthetic-corporeal mode, for children from 3 to 8 years old.
Bertsch (1983)	*Test of Motor Creativity*	It consists of a battery of four tests available in two versions (form A and form B). Form A consists of undefined tasks, i.e. tasks with unspecified objectives and operations; Form B

		consists of semi-defined tasks which indicate the objective, but not the operations to reach it, intended for children between the ages of 5 and 8.
Runco (1986)	*Creative Activities Checklist*	It is a test for children and is based on the concept that when people perform creative activities their thinking and their actions are guided by a personal definition of creativity. The test asks participants to indicate the frequency with which they have recently participated in activities in different areas: literature, music, theatre, art, crafts, science.
Torrance et al. (1988)	*Style of Learning and Thinking*	SOLAT is a questionnaire designed to measure individual differences in thinking style (right or left)
Antonietti (1992)	*Test Creatività Infantile TCI*	It measures the creative potential of children: specifically, some tests evaluate the fluidity, flexibility and originality in spontaneous production tasks starting from visual and auditory stimuli.
Cleland and Gallahue (1993)	*Divergent Movement Ability Test*	The test includes three locomotive / motion tasks. Evaluation of engine fluidity and engine flexibility is based on the specific cards. Evaluation of engine fluidity and engine flexibility is based on the specific cards.
Williams (1994)	*Test of Divergent Thinking*	This test requires evaluating eight factors of divergent thinking and personality development of creativity. It can be given to boys and girls between 6 and 8 years of age both through individual and group administration.
Urban and Jellen (1996)	*Test of Creative Thinking Drawing Production (TCT-DP)*	The assessment tool is based on the design of the production. The inputs for the test are figurative elements or fragments of an incomplete and irregular nature.
Artola, Ancillo, Mosteiro y Barraca, (2004, 2010)	*PIC-N: Prueba de Imaginación Creativa para Niños*	The objective is the evaluation of narrative and graphic creativity, through the use of the child's imagination or imagination, which allow to obtain a global score in creativity.
Romo, Alfonso-Benlliure & Sánchez-Ruiz (2008)	*Child creativity test TCI*	TCI can be applied from 6 to 12 years and evaluates the creative process from a structured activity in two phases: formulation and solution of the problem. The test considers not only the final result (a drawing) but the previous phases that bring it.
Antonietti, Colombo & Pizzingrilli, (2011)	*Extension Connection Reorganization (ACR)*	A version has been prepared to evaluate the creative abilities of children. The cognitive change that underlies creativity can take place thanks to three mental operations: enlargement, connection, restructuring

Lubart, Besancon, & Barbot, (2011)	*Evaluation of Potential for Creativity EPoc*	It was developed in France and wants to measure: the divergent-explorative thought and the convergent-integrated thought
Garaigordobil & Pérez (2005)	*Escala de Personalidad Creadora EPC*	The EPC is intended for children aged 10 to 11 and is composed of 21 statements, in positive terms, on behaviours and traits of the creative personality and which are raised on a scale of four alternatives.

4. Discussion

In the light of the several theoretical frameworks and the evolution of research lines of creativity, during over 50 years, a variety of tools and procedures have been developed that are able to interpret and evaluate creative processes from different perspectives. For example, evolutionary theories start from the assumption that the creative potential is present in each individual and needs to be increased within the school and in family system; psychometric theories have the primary objective of quantifying and measuring the individual starting potential, and in conclusion cognitive theories are mainly concerned with the cognitive processes that create the creative act. The choice of one investigation tool over another should be a direct consequence of the careful selection of the aspect of creativity to investigate: different measures return different skills all attributable to different levels of creative thinking, ability or competence.

Seen the large number of tests aimed at evaluating creativity, the need to conceptually organize the different ways, in which creativity can be measured, emerges. Creativity can be assessed from two perspectives: as a potential ability or attitude, both in cognitive terms and in personality traits with the aim of identifying the typical characteristics of creative individuals; or as a real behaviour.

If we take as an example the approach typically used in psychology in the investigation of creativity, we see how this is generally of a psychometric type using specific personality tests. These methods belong to the same theoretical disciplinary context and are based on many of the items developed by Torrance to identify the components of divergent thinking. Torrance's work, in turn, is based on Guilford's works which led to the distinction between two forms of thought: convergent thinking and divergent thinking. The first refers to the tendency of the human mind to limit itself to a limited area to reach the solution of a problem; in direct

opposition to divergent thinking, which is instead associated with creativity and which refers to the possibility of moving in an open field that offers innumerable solutions (Guilford, 1960).

The latter is emphasized in psychometric intelligence tests and in most evaluations; in fact, there is a widespread consensus that divergent thinking is a valid measure to estimate the potential of creative thinking in individuals, and therefore a better indicator of creative thinking. (Runco & Acar, 2012). Some examples of divergent thought tests developed and used for measuring creative potential are the Remote Associates Test (RAT) (Mednick, 1966) and the Torrance Test of Creative Thinking (TTCT) (Torrance, 1966).

The Thinking Creatively in Action Movement (TCAM) (Torrance, 1981), the Test of Motor Creativity (Bertsch, 1983) and the Test of Motor Creativity by Wyrick (1968) are also widely used and they prefer a response in kinaesthetic-body mode. Although the attribution of the scores in the different tests is calculated in different ways, the common bases of the components of divergent thinking are detectable.

From the analysis of the various tests that analyse the non-verbal dimension of creativity present in the scientific literature, it is easy to see how most of them are aimed mainly at the developmental age and therefore spendable in the educational-school environment. Most of these tests require the child an effort in the creative process with divergent exploratory thinking tasks (in which the child has to generate many ideas from a stimulus) and integrative-convergent thinking tasks (in which the child has to produce a single solution that integrates different elements), in motor and graphic-artistic areas. The strictly figurative and motor character of a test excludes the interference of verbal skills in the execution of the test. In addition, these tests pose "well-defined" problems and require individuals to create multiple solutions, which are then assessed using classic indicators (dimensions), like most of these tools. In particular, it can be found that the motor domain, under study for the construction of methods of evaluation of motor creativity by different authors (Bertsch, 1983; Cleland & Gallahue, 1993; Torrance, 1981; Wyrick, 1968), following the models previously adopted by Guilford (1960) in the evaluation of the creativity implemented during activities and actions aimed, is evaluated using the fluidity, flexibility, elaboration, and originality dimensions (Scibinetti et al., 2011).

Some recent tests, although presenting typical characteristics of creativity common to other instruments, in the method of administration have gone beyond the traditional approach. For example, the instrument conceived by Antonietti (1992), TCI Childhood Creativity Test (Antonietti, 1992) studied to measure children's creative potential, in some tests evaluates the different dimensions of creativity (fluidity, flexibility and originality) in tasks of spontaneous production from visual or auditory stimuli; in other tests, on the other hand, he evaluates

creative intellectual skills in more complex tasks. The Italian research group subsequently published the Child Creativity Development Program (PSCI) (Cerioli & Antonietti, 2001), an educational instrument, useful for promoting fluid thoughts and emotional tests, in the structured form of a training, which constituted the matrix for a general reconsideration of the teaching of creativity at school and initially conceived as a narrative device capable of linking various operative proposals of stimulation to creativity in children from 5 to 10 years. The activities revolve around a story that activates, on various levels of reality and fantasy, different characters and problematic situations. Children are invited from time to time to exercise their cognitive potential of a productive type and at the same time to practice regulating their emotions, through a game that is never fully explained based on fictions, projections, identifications. (Cerioli & Antonietti , 2001).

This approach is more ecological than some of the tests in the literature which often present the limit of evaluating creativity in contexts that are very different from those of everyday life. Furthermore, many tests resume tests developed in the context of adult neuropsychology and are subsequently adapted to the developmental age. About that, it is essential to underline that each evolutionary phase of the subject has specific characteristics as regards the execution of creative tasks. Therefore, the result of a child has different peculiarities compared to that of an adult; as well as differences between similar ages, since experience provides more elements to produce more elaborate and innovative alternatives.

5. Conclusion

The selected tests request a nonverbal or graphical response mode in action to verbal and visual-tactile stimuli. It is very complex to define creativity because it concerns different capabilities highlighting particular aspects, or dimensions, of the construct. Rhodes (1987), in the attempt of providing a complete framing of creativity, proposed to classify models based on the focus on (a) the person who creates, (b) the cognitive processes involved in the creation of ideas, (c) the environment in which creativity occurs, and (d) the outcome of the creative activity. The analysis of the literature shows that there are and there were in the past, many creative thinking test focusing on non-verbal dimension. Various studies have been carried out (Zachopoulou, 2006; Sturza, 2012; Bertsch, 1983) which have emphasized the motor domain more especially in pre-school age, showing that there are different points of convergence between motor creativity and creative thinking in children, and that executive functions have an impact in the production of creative movements and thoughts (Scipinetti et al., 2011).

The strength of tests that also use the non-verbal dimension, is certainly those to be a useful investigation tool both to have a more complete picture of creativity and to analyze the potentialities through a channel, sometimes more developed than the verbal one particularly in children with certified disability.

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Where to go Hungarian football top-tier championship?

Lili Kassay,
ELTE PPK,Institute of Health Promotion and Sport Sciences, Budapest, Hungary

Abstract

Hungarian football NB I. despite the sporting federation's (MLSZ) ten-year strategic aspirations, regulations and channelled state resources failed to achieve the key goals of increasing audience numbers, establishing responsible management at the club level, and integrating academy players into the adult teams. The UEFA Annual Comprehensive Report shows progress in key areas for the sport's top-tier championships, including the Hungarian one. However, the details show different development dimensions and dynamics when it comes to the so-called TOP domestic championships and the middle and low-income countries. Despite the growth and healthier operation, the gap between the big five and the other leagues has widened. he business development of the Hungarian NB I. stopped just after the period presented by UEFA. The stalemate is so significant that the MLSZ presidency is introducing changes to international UEFA regulation - for a stakeholder group where all clubs are privately owned, who, as an owner, should make their own decisions and serve their consumers with business responsibility. The ownership, organizational, regulatory and operational environment raises a number of issues which, despite repeated attempts, have not been satisfactorily addressed by stakeholders. The youngest of the North American leagues, operating since 1996, MLS offers an excellent model of this centralized and business-driven market building. It differs in its elements from the construction and operation of other traditional leagues, which elements offer the opportunity to move forward to lay the foundations of the Hungarian organizational, operational and business model.

Keywords*: investor-operator owner, MLS business model, standalone entity*

1. Introduction

Despite the use of direct and indirect state resources and stabilization by the 2015/16 championship season, Hungarian football NB I. has experienced a decline in several key areas for the 2019 season. The audience is nowhere near the strategic goals, the management of the clubs is irresponsible, and sports issues remain unresolved.

In 1996, football started as an unknown sport by American standards as its fifth major league on the continent. The ownership and organizational structure of the MLS and its business model provide a possible way for the development and operation of sports in the development of the business framework of Hungarian football.

2. Material and methods

Some stakeholders continue to believe in the functioning of the European sports and business model. However, with the globalization of the sport, the external environment, the target system of the stakeholders, the possibility and direction of adaptation have made the players more open to new solutions. This paper provides an overview of the American fifth Major League, MLS, based on secondary data collection and document analysis. It collects and organizes information on the key organizational and business processes of a successful sport business development, which, from a starting point, exhibits a number of similarities to the operational and business challenges of Hungarian football.

3. Results

Revenue development in European top-tier football championships

European club football is undergoing significant development in the way it operates its business. The development process is showing only significant changes, but these advances are pointing towards systemic sustainability. The UEFA Study (UEFA, 2017), which summarizes the results of the 2017 business year, reports a record operating profit of $ 1.4 billion, an increase of 60% over the previous year. At the same time, 2017 is the fifth consecutive year from 2013, when the aggregate result of first-class championships is positive. (UEFA, 2017, pp. 93). Since the first analysis of the business results of all member states' top-tier championships (2008), 2017 was the first year in which aggregate profit after tax was also positive. (UEFA, 2017, pp. 94). Over the period 2008-2017, total revenues increased practically year on year, averaging 973 million € per year. However, each source of income has varied to some extent and has a different share of revenue compared to the base year. Ticket revenues increased, but their weight within the revenue structure decreased. Broadcasting rights and UEFA prize money have become increasingly important. (UEFA, 2017, pp. 50). From the point of view of healthy management, the evolution of one of the biggest cost items is by no means negligible. Wages increased in almost all leagues (6.7%), but as a result of increasing revenues, the proportion of wage payments gradually decreased (61.3%) (UEFA, 2017, pp 71).

The 2017/18 championship season also set a record for the number of on-site spectators with 105 fans (UEFA, 2017, pp 38). However, the overall picture obscures a very important

detail. Only 20 clubs (!) generated 49% of the total 1.415 million € in ticket revenue for all top-tier clubs in the year (UEFA, 2017, pp. 65)

The revenue gap between the TOP leagues and the "other" top-tier championships continues to widen

The disproportionate distribution of ticket revenue already points to the business performance difference between the clubs in the TOP leagues and other leagues (Figure 1). 74% of the revenue is generated by clubs of the Big Five. If you add markets that are still generating significant revenue, you can see that 10 out of 55 European Championships generate 88% of European Premier League revenue! The other 45 countries (including Hungary) share 12% of the revenue of more than 20 billion € by 2017.

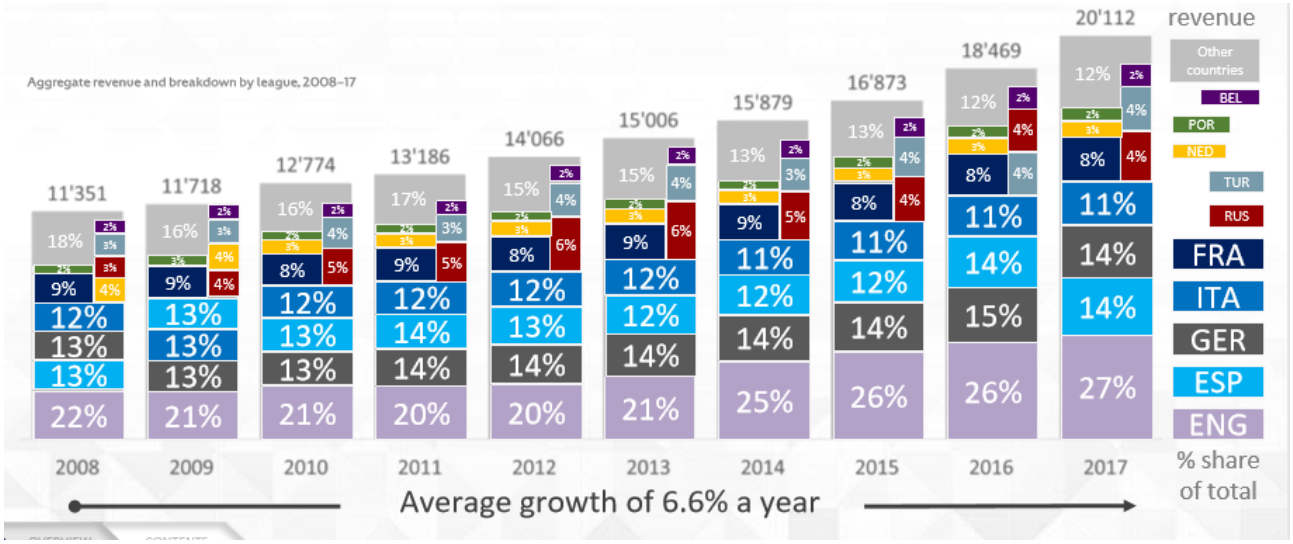


Figure 1. The income gap among European football leagues has further widened (UEFA, 2017, pp 48)

Almost all of the top twenty markets ranked by average revenue, including the Hungarian Championship, achieved significant growth over the 10-year period under review. While the first seven leagues show double or triple-digit growth, complemented by Belgian and Swiss clubs, the other leagues have "only increased by one digit. They have grown, but the dynamism of their growth is significantly lower than that of the leading riders mentioned. This comparison also shows that, despite expansion, the economic strength of a significant number of championships is declining in proportion. Including the absolute and relative development of the income generating ability of Hungarian football. (Figure 2.)

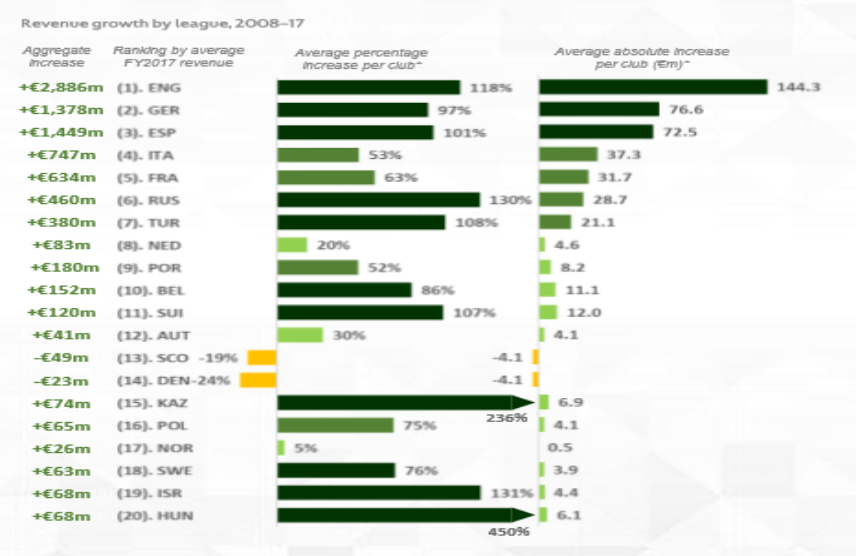


Figure 2. Increase in average revenue per club for the 20 top-ranked domestic championships over the 10 seasons examined" (UEFA, 2017, pp 51)

In the 16 billion € market in 2014, the English Premier League alone generated as much revenue (€ 3.9 billion) as the "other" countries (€ 3.9 billion, a 24% share). During this period the Hungarian first class championship was still in the so-called middle class (27th place). (UEFA, 2014, pp. 38). Thanks to the increase in resources, the Hungarian Championship has caught up with the 20th position, but its distance from the top is still very far away (figure 2.).

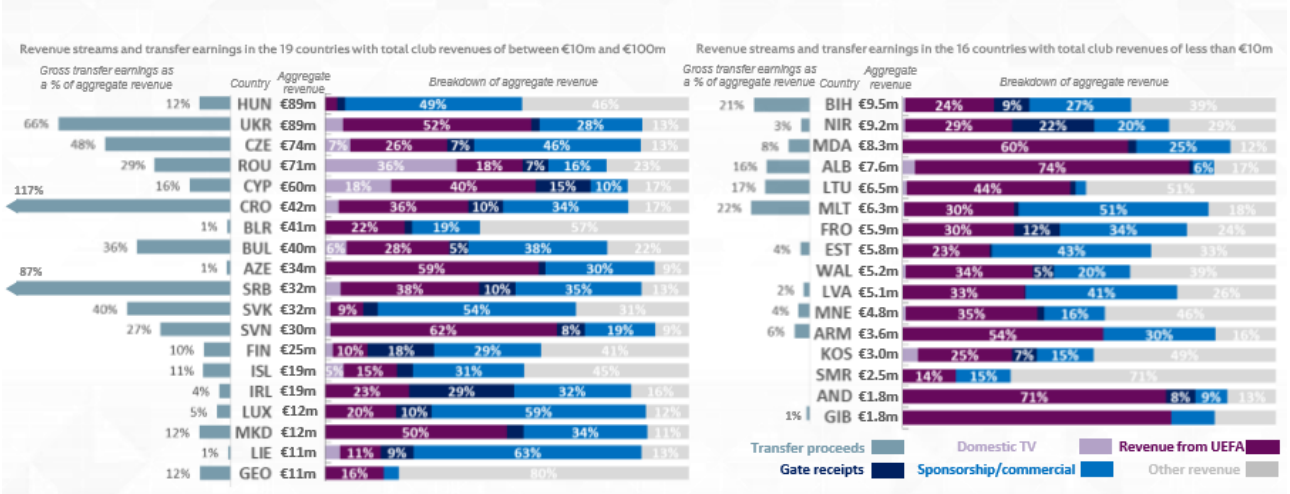


Figure 3. Revenue streams and transfer earning in the "others" countries (UEFA, 2017, pp 69)

In terms of the source of revenue, "other" championships show a very diverse picture. The proportion of transfer revenues, considered separately from consumer market revenues, is

outstanding in countries those run youth player development programmes successfully (Ukraine, Czech Republic, Croatia, Serbia). Hungary, with transfer earnings of 12% of its total income, is not a determining factor. Within the revenue structure, sponsorship and so-called other revenues are dominant. (UEFA, 2017; Székely, 2020; Székely, 2019). In case of championships with similar or approximate amount of income, success on the European competition level is decisive in earning money (revenues from UEFA) (Figure 3).

4. Hungary in the light of international trends

UEFA's efforts to reduce costs while ensuring and maintaining a competitive balance create guidelines and regulatory options related to the size and composition of the player pool. The new Intelligence Center of the European Federation not only focuses on communicating data, but also seeks to work with the leagues and federations to develop a strategy. In addition to improving business results, issues that affect both the game itself and business performance are prioritized. One of the central topics today is the inclusion of foreign players in the championships, and the effect this has on the national teams and the championship.

In the 2015 report, UEFA presented for the first time a comprehensive team composition practice (squad limits, loan restrictions and nationality rules). The 2017 report mentions 34 countries, including Hungary, where there is no restriction on the use of loan players (UEFA, 2017, pp 18) Locally trained player rules are used in different ways in European Championships. The so-called UEFA-style locally trained player approach[2] regulates 15 championships, including England, Germany and Italy. The hard minimum requirements[3] are followed by 8 leagues. The majority of 29 countries, including Hungary, do not apply any "home-grown or locally trained player rules". According to UEFA regulation, clubs must name "A list" squad members at a particular point in the season, and "B list young players" may add to the frame[4].

[2] UEFA-style locally trained player approach: „i.e. squad limits are reduced if the minimum number of locally trained players is not complied with". These leagues use the basic '4 + 4' requirement as UEFA (four association-trained players and four club-trained players). (UEFA, 2017, pp 20)

[3] Hard minimum requirements: These rules vary from league to league and may relate to the starting 11, the match day squad or the overall club squad (UEFA, 2017, pp 20)

[4] Squad limit: "at each stage of qualifying, before the play-off stage, before the group stage and before the knockout stages. This list may contain no more than 25 players and is reduced if fewer than four club-trained and four association-trained players are included. Clubs can register additional youth players at short notice throughout the season, by means of the 'B list'. From the 2018-21 cycle clubs are also allowed three subsequent player registrations before the start of the first knock-out phase (including players who have already played for another club in UEFA competitions in that season)." (UEFA, 2017, pp 19)

Hungary ranks second in aggregate revenues (56 million €) in the middle and low-income markets. The average salary of Hungarian clubs is 4.7 million €. Looking at wage growth, it is clear that Slovenia is the first (32%) in growth dynamics, while Hungary has the second highest wage growth (26%) (Figure 4)

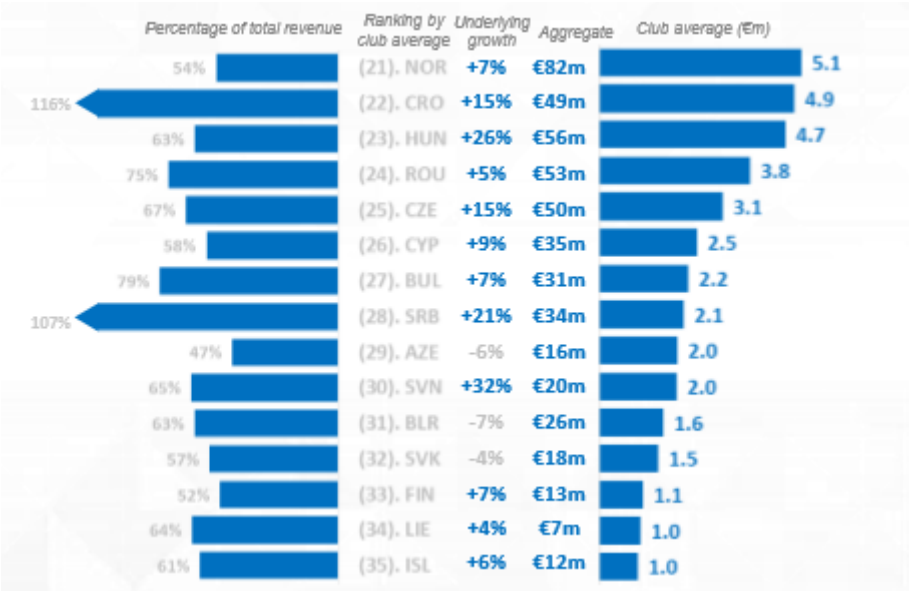


Figure 4. Wage-to-revenue ratios in leagues outside the top 20 (UEFA, 2017, pp 73)

Comparing the revenue and expenditure of each of the middle and low-income leagues clubs, it can be seen that the number and proportion of teams generating profits and losses varies greatly within and between championships. It is common for all championships to have both profitable and losing teams in the same championship. Hungary closed 2017 business year with 8 profitable and four loss-making clubs, according to official UEFA data for 2017 (Figure 5)

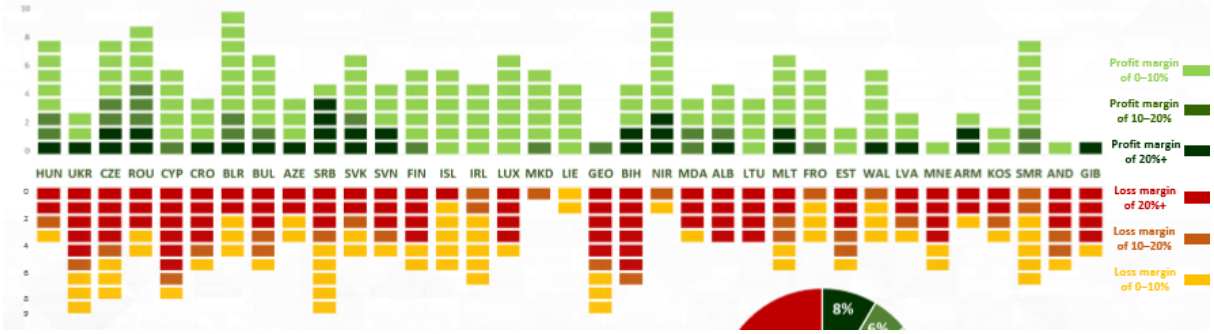


Figure 5. Profitable and loss-making clubs within each top domestic championship (middle

and Organizationally, who is responsible and for what in a championship, what it manages, what it can regulate and to what extent - commercial rights, fixture schedule, charge of

disciplinary matters, refereeing matters - are very different for UEFA member organizations (Figure 6).

Championships can be divided into four groups in terms of organizational, managerial rights, responsibilities and duties. One of the groups (5 leagues) includes those who manage either commercial rights or the development of a competition calendar as independent legal entity. For the 17 championships of the second group, both the commercial rights and the creation of the competition calendar are the responsibility of and managed by the league with its own legal personality. Of the UEFA member countries, 6 leagues decide and act on virtually every major issue. There are a total of 26 championships for which the national federation is fully responsible. Hungary is also a member of this latter group.

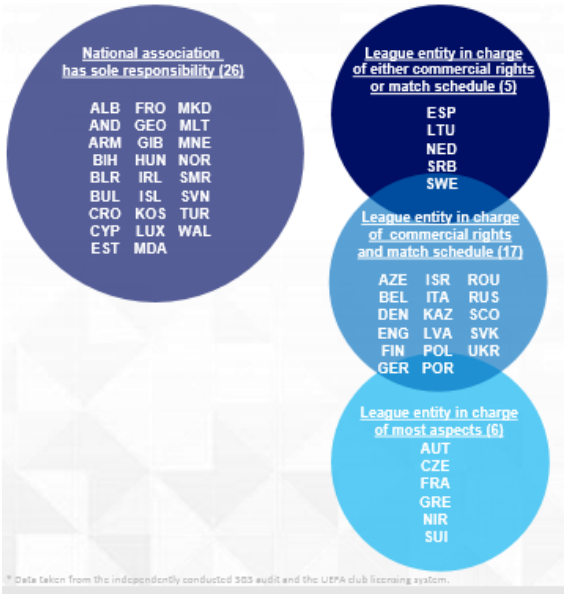


Figure 6. Organisation of top domestic leagues (UEFA, 2017, pp 17)

First-class football is part of the business-based entertainment industry in Europe, and clubs in the sector decide on use of a multi-million-euro budget.

It is not at all irrelevant what the legal-organizational framework of the clubs is and who makes the ownership decisions that will result in a sports company operating effectively and sustainably. The ownership structure varies widely across Europe for each championship. Private ownership business motivation may differ in part from the values mediated by fan membership and may be significantly different from the motivations of clubs owned by municipal or state-owned companies (Figure 7). In the case of Hungary, the summary of the European federation indicates both private and community-owned clubs among top-tier teams. According to the MLSZ Club Licensing Regulations (MLSZ, 2017, § 2.5 (3))

published during the period under review, clubs operating in the form of an economic corporation may apply for the club license required for the next championship start.

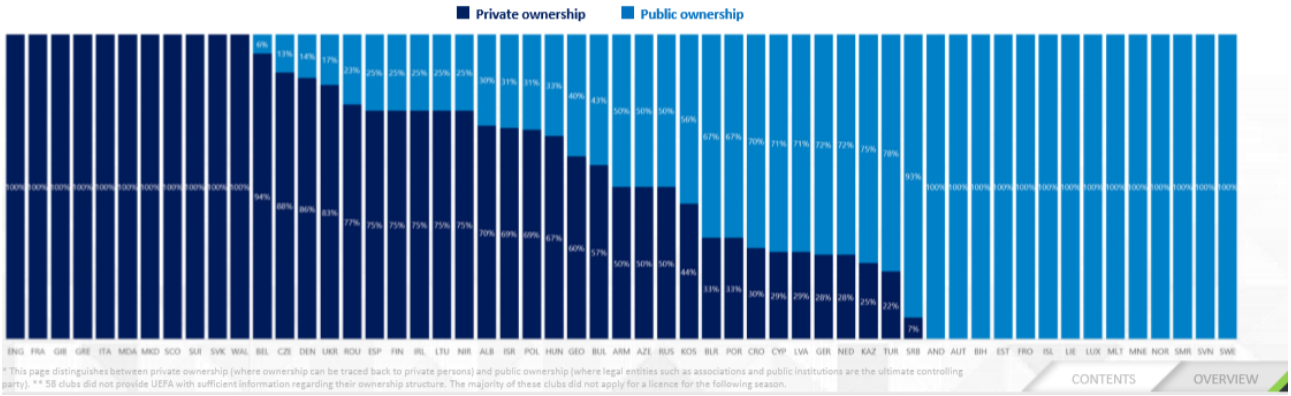


Figure 7. Ownership structure of clubs in European top-tier championships (UEFA, 2017, pp 23)

5. Hungary - sport funding, including football and its resources

In developed western countries, sports funding is based on three pillars, with a share of 1/3 to 1/3 (state, business, households). 70% of the state subsidy supports the development of recreational sports and 30% of the professional sports (Sárközy, 2017). Sárközy estimates that 90% of sports funding in Hungary comes from public funds: from central and local government budgets, TAO (Gősi & Nagy, 2016), public media royalties, gambling money, and "sponsorship" activities of state-owned companies . 70% of the Hungarian state subsidies go to top-level sports, only 30% to strengthen recreational sports. "It is very difficult to determine how much the Hungarian state spends on sports a year. Different economists say quite different figures, often billions. In my opinion, the system is not transparent, transparency is inadequate" (Sárközy, 2017, pp 155).

All analysts point out that direct or indirect public money flowing into sports, including football (Figure 8) (Gősi, 2019a; Lőkös & Kiss, 2018; Bita & Pető, 2018) essentially leads to overfunding, which can even counter-productively increase performance . In addition, it is no longer able to gain the support of the general public in principle (Publicus, 2018).

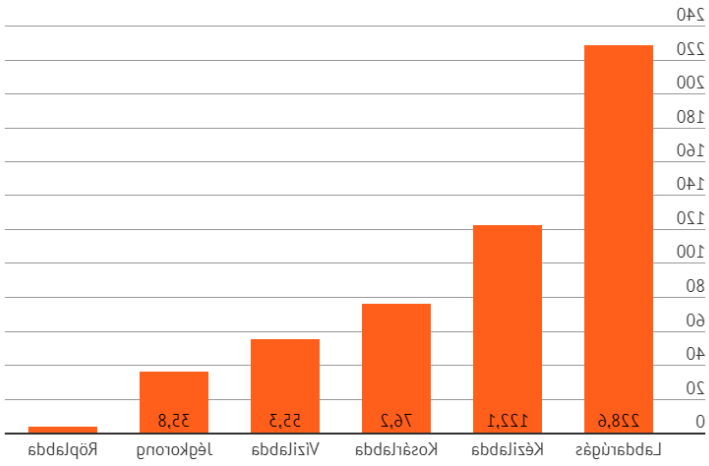
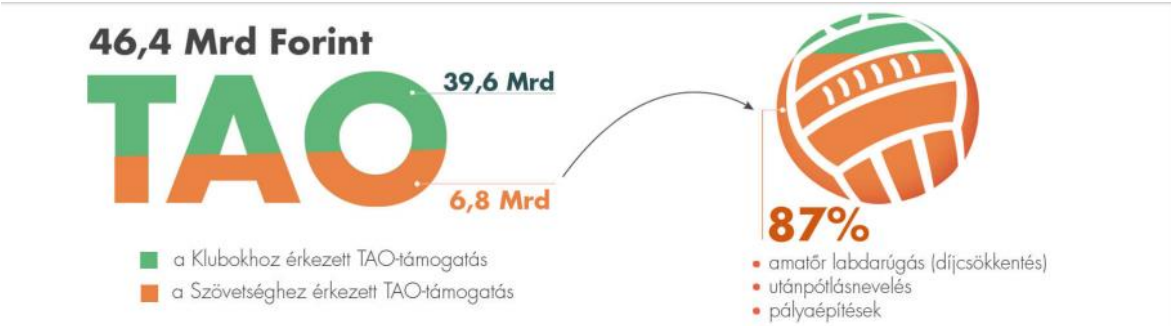


Figure 8. TAO support per sport 2011-2017 (Bita & Pető, 2018)

At the General Assembly held in the spring of 2019, the MLSZ reported on the results of the period since the new management took office, including the use of TAO funds managed by the MLSZ (Figure 9). Aggregate data show that one of the focal points of the National Association's work to expand the sports base is the development of amateur football and youth (MLSZ, 2019a).



MLSZ TAO

Jogcím	2011	2012	2013	2014	2015	2016	2017	2018	Összesen
Utánpótlás	1,5	1,1	1,8	2,0	4,1	4,5	0,9	3,5	**15,9**
Amatőr labdarúgás	2,1	2,4	1,6	2,9	3,8	5,4	4,3	1,0	**22,4**
Személyi kifizetések	0,6	0,6	0,4	0,6	1,0	1,5	1,3	0,6	**6**
Tárgyi eszköz	0,0	0,0	0,3	0,0	0,4	1,0	0,5	0,6	**2,3**
Képzés	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,0	**0,3**
Infrastruktúra	0,0	2,8	3,6	3,0	3,5	3,2	2,9	1,1	**19**
Összesen	**4,2**	**6,9**	**7,7**	**8,5**	**12,9**	**15,7**	**10,0**	**6,8**	**65,9**

Figure 9. Use of TAO money managed by MLSZ (MLSZ, 2019a).

However, the situation regarding the number of Hungarian and foreign players and their relative share was not positive at all, as the initial positive processes stopped and even reversed, resulting in a sharp drop in the employment of young Hungarian players and a sharp increase in the employment of foreign legions. Figure 10).

MLSZ has been pursuing strategic goals for it at the beginning of its ten-year development (MLSZ, 2010). By the end of the decade, by contrast, professional club football continues to be financed by public funds. Although "Hungarian football will have to bring in public money this year and not have to carry it, this year the government has planned to spend more than one hundred billion football-related expenditures" (Jandó, 2019). MLSZ leadership is explicitly self-critical and ready for fundamental operational changes. “There has been a significant improvement in club management between 2010 and 2015, and 16. There were a lot of deficits, incomes increased, everyone settled the deficit, business administration stabilized and we were confronted now, last year or even this year, with quite a few clubs in NB I and NB II is in danger zone. So their management is inadequate”, President Csányi kept a mirror for the participants of the General Meeting (MLSZ, 2019b). More than 40% of certified NB I players do not play, the number of minutes of young Hungarian players is constantly falling, and several clubs have financial problems. In contrast, the strategic goal was the opposite: to reduce the playing time of foreign players and to increase the number of young players (Rényi, 2019).

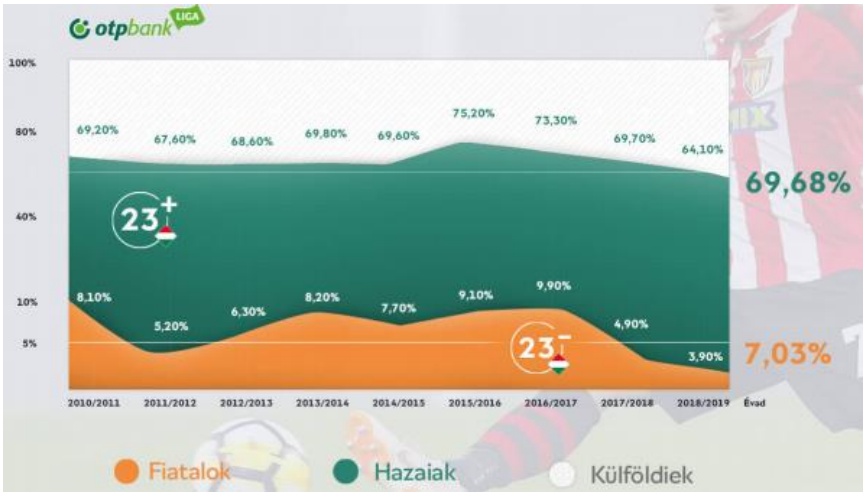


Figure 10. Changes in the proportion of Hungarian and foreign players within teams between 2010-2019 (MLSZ, 2019a)

He shared awesome statistics with the audience. The teams contracted 504 players, but 223 (!) Of them did not play for a minute. The average is 42 players per team! “You can't have a say in a coach's job. How come you can't speak? Well, whose money are you spending? (..) I would categorize it as misappropriation (…) because it is not his own, he did not put in the money, he does not spend his own money, respect for the exception (…). Everything we have achieved by 2016, 17, has turned back. And the changes were made because the clubs asked for it and suggested it because they thought it would make Hungarian football better”. But the MLSZ came to the General Assembly with serious regulatory ideas. All provisions of the UEFA Financial Fair Play Rule will be applied. They also maximize the number of players, taking into account the UEFA regulations for A and B players, and introduce a payroll regulation (MLSZ, 2019b).

Despite previous intentions, reducing the number of foreign players remains a plan. The presidential decision of early 2020 still does not limit the number of legionnaires. This deregulation still maintains the contradiction between the public-funded youth supply and the non-inclusion of young Hungarian players into the adult team. The teams had not previously been in need of extra money for the youth and did not follow the MLSZ recommendation (Haszán, 2020; Gősi, 2019b; Gősi & Sallói, 2017).

6. Most important regulators of the major leagues in North America

In the so-called closed system of the major leagues in North America, the competition is based on a well-regulated business model. Competitive teams are constant, no promotions and relapses, and the system is predictable and long-term. Club-level operation relies on local and central revenue (redistribution, equalization, efficient operation). The expenditure side is limiting and regulating (salary cap, contracts, draft, CBA, expansion) The business model works with the league's profit maximization in mind. In Europe, the salary cap is generally highlighted by those seeking to regulate business, but it is only one of many elements that ensure league-level competitiveness and club-level functionality (Kassay, 2019). Of the North American leagues, American football (NFL), baseball (MLB), hockey (NHL) and basketball (NBA) operate the league on essentially the same principles, with some elements operating differently (e.g. in case of salary cap mentioned earlier, where there are so-called hard and soft controls).

Each club has its own owners, and these owners jointly form and manage the league, shaping the league's operating framework and rules in their own way. The youngest MLS

operating since 1996 differs significantly from this ownership and organizational structure and from certain operating principles. MLS is an entity that owns each team and retains ownership control, allocates players and manages players' contracts. “Once the MLS decides a team is able to stand on its own, and currently most are, it allows investors to buy into the team and run the organization independent of the MLS, while the MLS maintains its own stake in such team.” (Shaikh)

7. MLS: Investors-Operators’ business model

In the traditional sense, MLS clubs have no owners, and in MLS they are called Investor-Operators. These "owners" invest in the same entity, MLS. This authorizes the Investor-Operator owner to operate a team owned by the league and generate direct revenue (local broadcasting rights, merchandising sold, stadium revenue, parking revenue). There are some revenues, some of which must be shared with MLS (30% of ticket sales, 25-44% of player transfer fees). “MLS directly takes all revenue from national broadcast rights, league-level sponsorships, and online merchandise sales” (Krasny, 2017) (Figure 11)

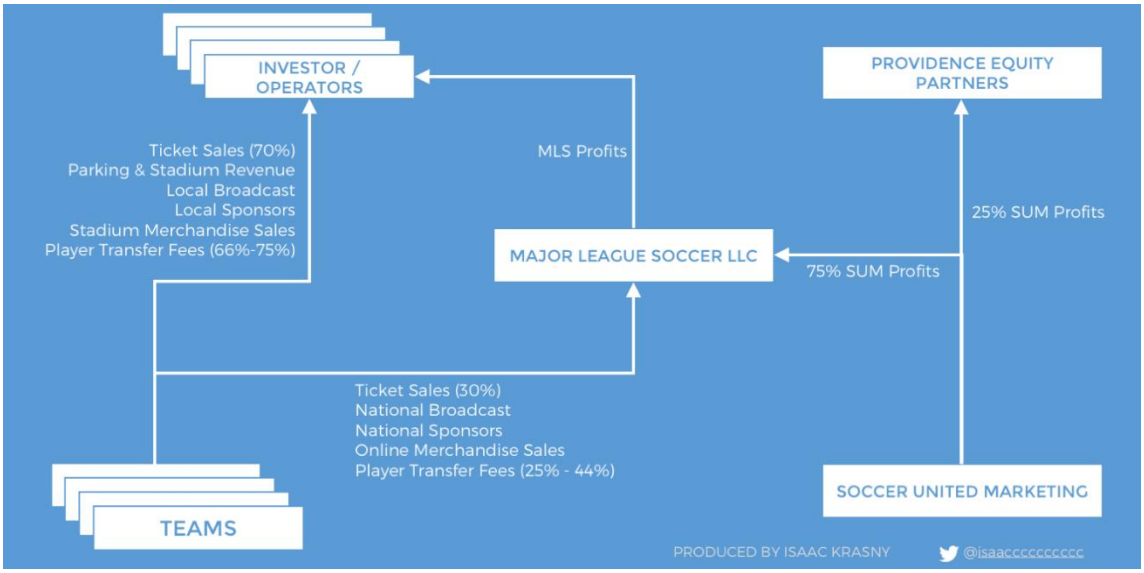


Figure 11. Revenue in MLS (Krasny, 2017)

Players' salaries and targeted allocation money are paid by MLS. Operational costs are largely covered by Investor-Operators. This includes the cost of the stadium, player development

mechanism costs (academies, training), front office costs (staff, marketing, sales, operations, travel) and salaries for designated players above the salary cap (Krasny, 2017) (Figure 12).

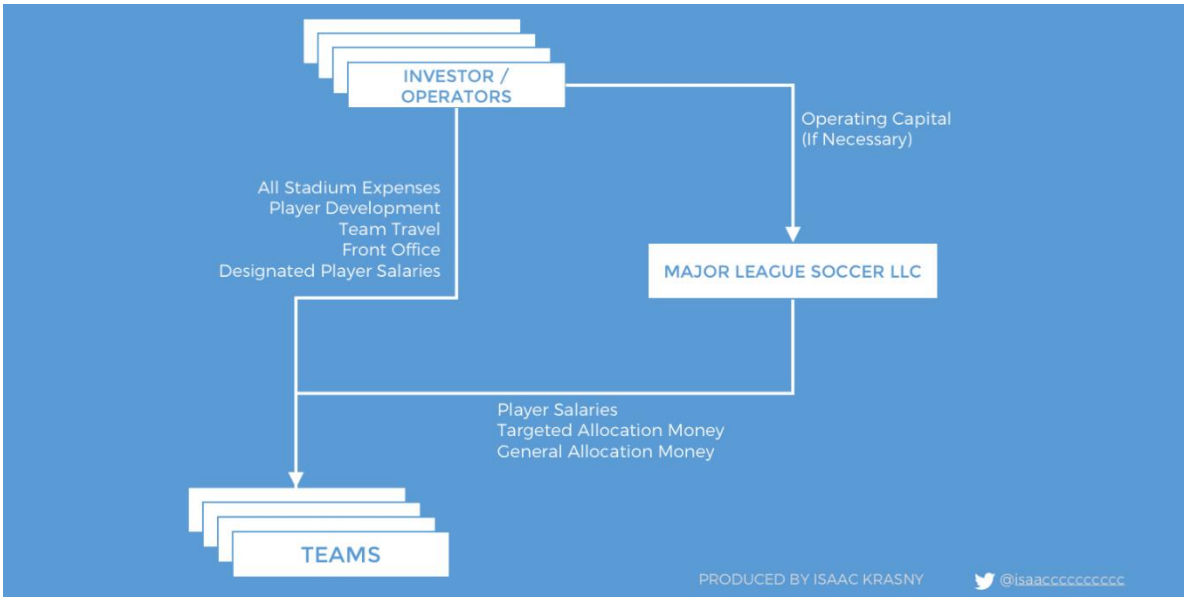


Figure 12. Expenses in MLS (Krasny, 2017)

The Investor-Operators who own the league are the same as those who operate each club. Therefore, they are sensitive to costs and interested in increasing revenues. MLS model stakeholders are interested in working together, no single club can change the operation of either the spending or revenue side.

Soccer United Marketing (SUM), which is 75% owned by MLS and 25% owned by Providence Equity Partners, is the clue to MLS's business model and successful operations. One of his tasks is to position the sport and the league in the North American sporting competition and to capitalize on the growing popularity of soccer. The other is to provide similar marketing services to other entities (Mexican Men's National Team, US National Teams, visiting professional teams).

8. Discussion: pros and cons

For MLS, football is the key product that focuses on making the game more interesting, attractive, and entertaining. Behind this, he created the organization, the allocation system behind the common intention, and operates its central and club level sales activities. "The MLS business model is complex, but purposefully built. Incentives are aligned so Investor-Operators focus on building their teams locally while MLS promotes the league nationally. Centralized

salary controls and tightly managed competitive rules ensure that more ambitious Investor-Operators can push the whole league forward, but not drive a spending spree that bankrupts the enterprise." (Krasny, 2017).

MLS intents "growing as large a national footprint as possible", showing a clear business interest in a sport where labor costs are relatively low (compared to other leagues) and where regional competition can generate fans. (Quillen, 2019).

The MLS is very purposefully aiming to build its fan base and create the business base with its biggest presence. The league-owned structure clearly supports this endeavour. At the same time, the business model generates less revenue, providing a narrower opportunity for MLS to attract young talent from Europe and / or South America, which situation in time could make MLS less attractive to fans. "A league-owned structure makes the most sense for a new sports league entering the market today." (Shaikh)

Football is the second most popular sport among 18- to 34-year-olds in the United States, according to a Gallup survey. This interest is also being exploited by MLS, and the number of on-site viewers is constantly growing. In addition, there is a great chance for grass-roots to develop, as most immigrants to the United States come from countries that love and play football. Another important factor for business development is that teams' wage costs increase very modestly. (Haden, 2018; McCarthy, 2018). What's more, the sport is particularly appealing to millennials because it has less advertising interruption and significantly shorter playing time than other American sports, and the diverse composition of the teams is very similar to that of a young fan base (McCarthy, 2018).

In spite of the hundreds of millions of dollars paid in expansion, MLS closed the business year at a loss. But what is the business logic behind not only MLS, but globally, the seemingly meaningless proprietary behaviour of pouring money into football with little hope of return? Sufficient explanation for this desire to gain ownership glory and status? – Szymanski asks the question (2015). Indeed, MLS will not be able to cover its real expenses (372 million $) from its actual revenue (estimated at 233 million in 2014 $). What's more, the league's goal for 2022 would require about 750 million $ a year. The ambition is to become one of the best championships in the world. "MLS cannot conceivably pay this amount AND have a situation where the clubs make money". (Szymanski, 2015). In contrast, Krasny argues (2017) that since MLS is a standalone entity, a private company, semi does not force full transparency, it has no obligation to convince anyone of its financial stability, so its financial position cannot be a Ponzi-like financial scheme or bubble.

It is true that MLS is still on the rise, with expansion plans for 28 teams and more recently 30-32 for expansion. But what happens next to the MLS racing system? How will it work? According to the NFL model? Or will they follow the NCAA? Or are they opening up to the European model? The answers are not yet known to the public, and MLS has not yet revealed this secret. (Quillen, 2019; Howell, 2012). But what will happen to the league anyway when you can no longer count on expansion revenue and manage only your own revenue? The major major leagues rely heavily on their TV royalties, which in turn is low for MLS. NBA revenue is $ 24 billion for nine years, NFL revenue is also $ 27 billion for 9 years, while MLS can provide $ 720 million over 8 years. And while the agreement expires in 2022 and a new contract can be signed, the problem is seen in the audience figures. Compared to all other sports, most matches are broadcast by football on TV and a significant portion of them offer better football than MLS with EPL and Mexican League clashes. It's true that MLS can keep wage costs low, “but these rules stand in the way of bringing in good players and making the product they sell better. (…) Soccer is unlike other American sports in that the best league in the world is abroad” (Cleveland, 2019).

9. Conclusion

Together, clubs create the entertainment value of building and serving fans. Serious collaboration in the background is needed to create the level, excitement, and amusement of the competition in front of fans. MLS provides an excellent example of the ownership, organizational and operational framework for this market-building and business work. Weaknesses - for example, due to relatively low player payments it does not compete with the revenue generating ability of the European TOP leagues - are irrelevant to the Hungarian Championship.

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Pole sport: yesterday, today and tomorrow.

Ksenia Yarovikova, Ekaterina Dytko and Smirnova Elena,
Foreign languages department,
Department of Humanitarian and Socio-Economic Disciplines,
Velikie Luki State Academy of Physical Education and Sport, Russia.

Abstract

Pole Dance is one of the most popular areas of modern sports dance in the world. Due to the combination of choreography, acrobatics, fitness and acting, this area can be called "unique". In recent times, a new branch in the sport called "Pole Sport" has been formed. This sport develops not only flexibility and muscles of the athlete perfectly, but is also very beautiful, it is pleasant to watch and observe pole performances. Pole Dance is one of the most popular areas of modern sports dance in the world. The story of pole dance is as short as it is mysterious. There are several versions of the origin of the pole sport. For the first time in Europe, official competitions and Championships in the discipline of pole sport began to be held in 2003. Since 2008, Pole Dance competitions have been held in Russia. For the first time the competition was held in St. Petersburg. The study of aerial acrobatics dance schools in Russia by federal districts showed that the largest number of dance schools is represented in the North-Western (32.8%) and Central federal districts (26.9%). The smallest number of dance schools (1.6%) is located in the North Caucasus federal district. Thus, aerial acrobatics schools in the central regions set the general line of development and movement for remote regions. Today, the pole sport has been granted observer status at the General Association of International Sports Federations (GAISF). Because of this, it can qualify for inclusion in the Olympic program in 2028.

Keywords: *pole sport, training services market, customer awareness, development perspectives.*

1. Introduction - Materials and methodology

The research methods were studying online sources devoted to pole sports and aerial acrobatics, and a questionnaire poll. A review of online resources took place in 2018. An internet survey based on the questionnaire consisting of 5 questions placed in the social network VKontakte was held in 2019 aiming at revealing people's awareness about aerial acrobatics. The participants of the survey were 150 respondents of 4 age groups starting from 14 up to 44 years old both male and female.

1.1.The object of research – the pylon as a specific type of sports activity.

1.2.Subject of research – pole sport.

1.3.The purpose of work is to study and identify potential opportunities for the development of pole sport today.

1.4.Research aims:

- To analyze the history of the formation of pole sport.
- To study the market of pylon training services in the Russian Federation.
- To identify the awareness of potential customers about Pole Sport at the federal level.
- To determine the possibilities of participation of pylon sport at the Olympic Games.

2. Discussion

According to one version, the pylon was first used in the XII century in the ancient Indian practice of mallakhamb training. It had the form of a wooden pole and served to develop the physical form and endurance of fighters. Hindu knowledge was passed on to circus performers. Tricks on a pole formed the basis of many programs, reaching even Cirque du Soleil — the most famous circus in the world.

According to another version, the dance has an American-Canadian origin, the first ones who guessed to use a pole in the dance were the participants of cheerful performances-burlesques, very popular in the United States.

According to the third version it is believed that its roots go East and deeper into Chinese circus acrobatics.

For the first time in Europe, official competitions and Championships in the discipline of pole sport began to be held in 2003.

Now in the world there are several International Federations such as: World Pole Dance Federation (WPDF), International Pole Dance & Fitness Association, etc. These organizations are engaged in international and national championships.

The world championships are initiated by the World Pole Sport & Fitness Organization and the International Federation of Pole Sports.

Since 2008, Pole Dance competitions have been held in Russia. For the first time the competition was held in St. Petersburg. In Russia, pylon sport as a sport or discipline has not

yet been officially registered by the Ministry of sport. It is not included in the all-Russian register of sports (VRVS), so the discipline itself is developed by both national all-Russian federations, individual representatives and regional federations. In Russia there are currently no uniform rules and terminology for this discipline, each of the Federations or even schools have their own system of judging, rules, names and classification of elements.

As of November 2018, the following all-Russian federations exist and continue to hold their annual sports tournaments in Russia, in which the discipline «Pole Sport» is present:

- The Federation of Air Athletics of Russia (FAAR);
- The Federation of Air Sports balance of Russia (FASR);
- Pole Sports Russia - is the official Federation recognized by the International Federation of Pole Sports (IPSF) in Russia;
- Federation of Air-Power Athletics of Russia (FAPAR).

The market of services of air acrobatics directions actively develops in recent years in Russia, borrowing and advancing various styles and trends.

3. Results

The study of aerial acrobatics dance schools in Russia by federal districts showed that the largest number of dance schools is represented in the North-Western and Central federal districts (Fig.1.). The smallest number of dance schools (1.6%) is located in the North Caucasus federal district.

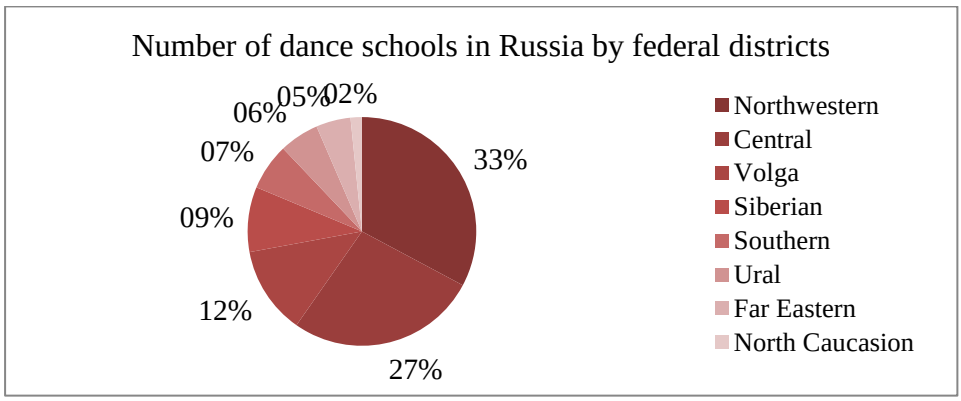

Figure 1. Number of dance schools in Russia by federal districts.

The far away from the Northwestern district, the more number of dance schools decreases. Thus, aerial acrobatics schools in the central regions set the general line of development and movement for remote regions.

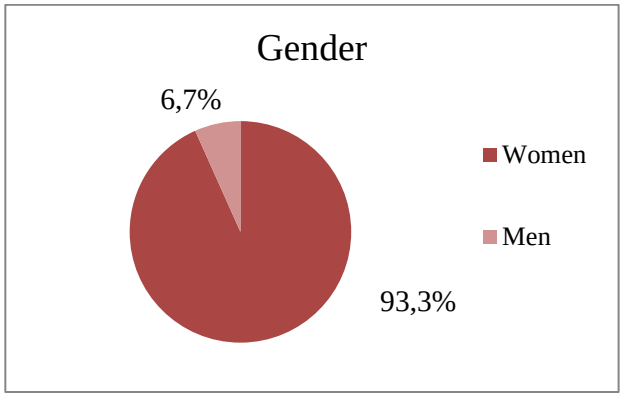

Figure 2. Gender of respondents

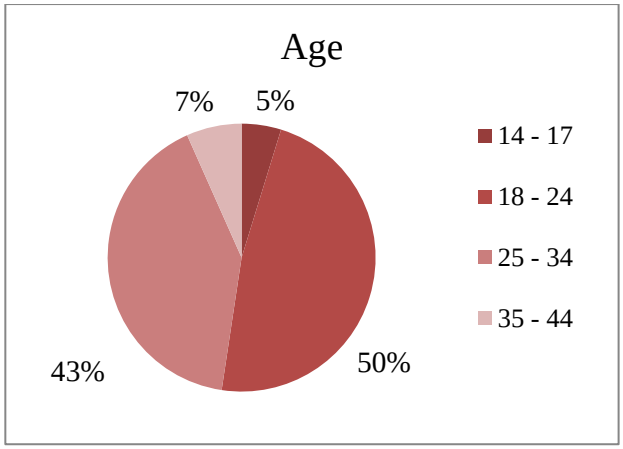

Figure 3. Age of respondent.

That 70% of respondents know about pole sport (Fig.4); there is a desire to be engaged in this type of sports activity in 55% of respondents (Fig. 5).

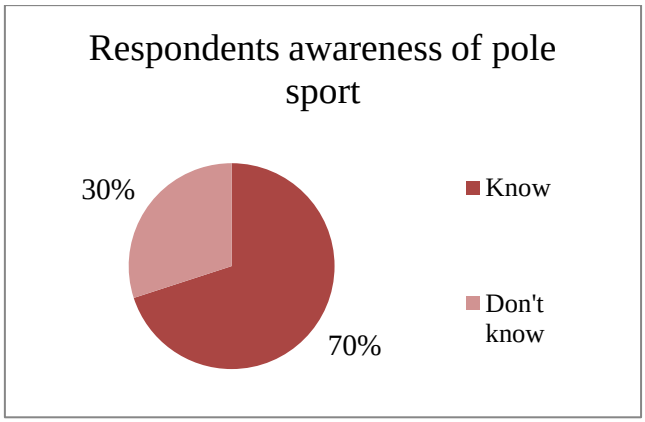

Figure 4. The degree of awareness of respondents about such direction as pole sport.

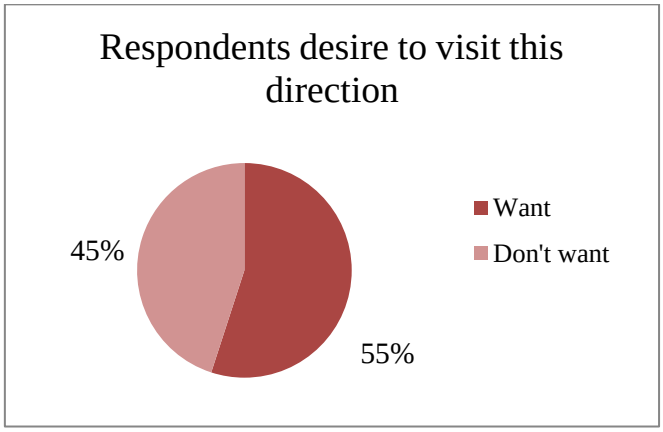

Figure 5. The desire of the respondents to attend classes in the direction of pole sport.

The main reason for refusing to attend a school is lack of physical fitness and a psychological fear of making the impression of being imperfect is present in 50% of research (Fig. 6).

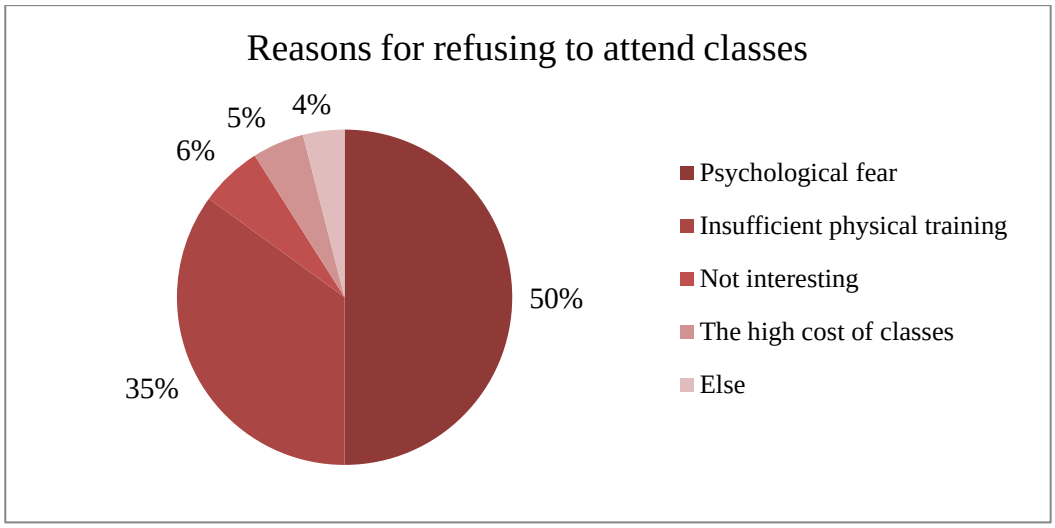

Figure 6. Reasons for refusal of respondents to attend classes in the direction of pole sport.

The pole sport continues to develop: children's Pole Dance classes are opened, improvised performances can be seen outdoors, there is even an underwater version of the pole dance.

How soon will we see the pole sport at the Olympics? Is it real? Of course, this will not happen very soon. The International Olympic Committee is certainly interested in a new young audience. This is the reason for the emergence of such sports as skateboarding, rock climbing, karate, baseball and surfing, in the program of the 2020 Olympic Games in Tokyo on a one-time basis.

The organizers strive to keep the Olympics relevant and attract more spectators. According to the rules, the new Olympic sport should increase the "value and attractiveness" of the Olympic Games, as well as reflect modern traditions.

It is noteworthy that in the new sport there are both women's and men's categories. Within the framework of the International Federation of Pole Sport, a special department of pole acrobatics for people with disabilities has appeared. So pole sports development is in full swing!

In 2009, the International Pole Sports Federation was established. In 2012, the Federation held the first world championship, which coincided with the Olympic Games in London.

Today, the pole sport has been granted observer status at the General Association of International Sports Federations (GAISF). Because of this, it can qualify for inclusion in the Olympic program in 2028.

4. Conclusions

According to the research results the popularity of pole sport and aerial acrobatics as one of its trends tends to grow mostly in the western part of Russia, and people's awareness of the above-named sports is quite sufficient – they realize that they can transform their body and personality. The pole sport is gaining new momentum at the international level and has already set a course for participation in the Olympic Games. Currently, the pole sport has already received the registration of the World Anti-Doping Agency. For this sport to become an Olympic one, it needs at least 50 national federations. So far, pole dancing has only about 20 of them around the world. But even if the necessary number of sports federations were recruited, there is still a very long way to go.

5. References

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